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The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

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Chemistry International

The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

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Front cover: Shipment of chemicals, see p.6 *(photos courtesy P&O Containers).*

1988 International Union of Pure and Applied Chemistry

The new Green Book

Kozo Kuchitsu

In this extended "guest editorial", *Chemistry International* Editorial Advisory Board member, Prof. Kozo Kuchitsu discusses the background, aims and content of the new Green Book and its abbreviated version.

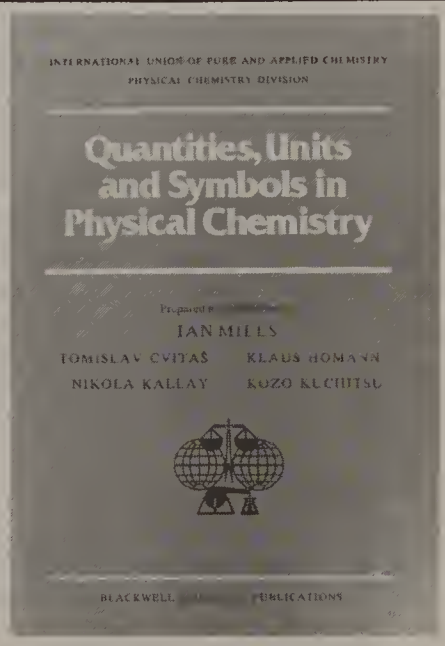
Prof. Kozo Kuchitsu, was one of the editors of the Green Book. His address is: Department of Chemistry, The Technological University of Nagaoka, Nagaoka 940-21, Japan.

Under the chairmanship of Prof. Ian Mills, the Commission on Physicochemical Symbols, Terminology and Units (I.1) has recently completed a major revision of the Green Book of the Physical Chemistry Division of IUPAC. Its title is *Quantities, Units and Symbols in Physical Chemistry* (see Box). An abbreviated version of the Green Book - intended for student use - has also just been published for the first time.

The original Green Book was first prepared for publication in 1969 by Prof. Max McGlashan on behalf of the commission[1]. The book made a significant contribution in "securing clarity and precision, and wider agreement in the use of symbols, by chemists in different countries, among physicists, chemists and engineers, and by editors of scientific journals"[1]. The second and third revised editions were published in 1973 and 1979, respectively

The commission started a new project in 1981 to prepare the present revised and extended edition. The new edition maintained the objectives and spirit of the original version, in order to keep up with the rapid progress in various fields of physical chemistry and to include important recommendations published by IUPAC and other international organizations.

The commission received many comments and suggestions on this project and so, in 1983, organized a working party: Ian Mills (chairman), Tomislav Cvitaš, Klaus Homann, Nikola Kallay and Kozo Kuchitsu. The members worked hard, met several times, and discussed the project extensively among themselves and with many experts both inside and outside IUPAC. The new edition of the Green Book is the result of this work.



Quantities, units and symbols in physical chemistry (the Green Book) was edited for the Commission on Physicochemical Symbols, Terminology and Units by Ian Mills. Tomislav Cvitaš, Klaus Homann, Nikola Kallay and Kozo Kuchitsu and published by Blackwell Scientific Publications, Oxford, UK, 1988. ix + 134 pp. ISBN 0 632 01773 2. Price GBP 19.95/USD 32.50. Affiliated Members Discount Price GBP 14.95/ USD 24.40

Abbreviated list of quantities, units and symbols in physical chemistry was prepared for publication by Klaus Homann and published by Blackwell Scientific Publications Ltd, Oxford, UK, 1987. 4 pp. Laminated card. Available only in packs of 10 or 50.
10 pack: ISBN 0 632 01774 0. Price GBP 15.00/ USD 22.14. Affiliate Members Discount Price GBP 11.25/USD 16.60. 50 pack: ISBN 0 632 01775 9. Price GBP 67.50/USD 99.40. Affiliate Members Discount Price GBP 50.60/USD 74.50

New features

The new Green Book consists of eight chapters:

1. Physical quantities and units.
2. Tables of physical quantities.
3. Definitions and symbols for units.
4. Recommended mathematical symbols.
5. Fundamental physical constants.
6. Properties of particles.
7. Conversion of units.
8. References.

New features of the book may be summarized as follows:

- Best attempts have been made to provide a manual of advice and assistance for the day-to-day use of practising scientists rather than a book of strict rules. Clear distinctions are made as to what is mandatory and what is optional, and in the latter case recommendations are made as to how to secure precision and avoid confusion. Typical examples are found in the extensive footnotes and explanatory text inserts. Detailed discussions are included on the use of quantity calculus for the conversion between SI and non-SI units, on the relationship between the different unit systems of electricity and magnetism, and on atomic units (chapter 7). The compromise between accepting the force of current usage (with all its imperfections) and leading towards a more logical (and simpler?) system is explicitly discussed in many examples.
- Much of the material has been taken from the published appendices to the former Green Book, from all the newer resolutions and recommendations on units by the Conférence Général des Poids et Mesures (CGPM), and from the recommendations of the International Union of Pure and Applied Physics (IUPAP) and of the International Organization for Standardization (ISO). Chapter 8 contains references classified into Primary Sources, IUPAC References and Additional References.
- Chapter 2 is a collection of the internationally recommended names and symbols for the physical quantities most likely to be used by chemists. For each physical quantity a brief defining equation and the coherent SI unit is given. The list has been updated and extended to cover 531 quantities, including entirely new sections such as quantum chemistry, solid state and colloid and surface chemistry. The sections on general chemistry, and on spectroscopy, in particular, have been reorganized and extended. The table shows three extracts from the tables in the book to illustrate the style adopted.
- The list of fundamental physical constants is taken from the recommendations of the CODATA Task Group on Fundamental Constants (1986 revision). CODATA is the Committee on Data for Science and Technology of the International Council of Scientific Unions (ICSU). The list of mathematical symbols has been extended to include operators and functions following the ISO recommendations[2].

Table. Extracts from the Green Book.
(a) from *"General Chemistry"* table *(Section 2.10, p. 37).*

Name	*Symbol*	*Definition*	*SI unit*	*Notes*
amount (of substance)	n	$n_B = N_B/L$	mol	1, 2
Avogadro constant	L, N_A		mol^{-1}	
mass of atom, atomic mass	m_a, m		kg	
molar mass	M	$M_B = m/n_B$	kg mol^{-1}	2, 4
molar volume	V_m	$V_{m,B} = V/n_B$	m^3 mol^{-1}	2, 4
mass fraction	w	$w_B = m_B/\Sigma m_i$	I	2

(1) The words 'of substance' may be replaced by the specification of the entity.

Example When the amount of O_2 is equal to 3 moles, $n(O_2) = 3$ mol, then the amount of $½O_2$ is equal to 6 moles, $n(½O_2) = 6$ mol. Thus $n(½O_2) = 2n(O_2)$. See also p.41 below.

(2) The definition applies to entities B which should always be indicated by a subscript or in parentheses, e.g. n_B or n(B).

(4) The definition applies to pure substance, where m is the total mass and V is the total volume. However, corresponding quantities may also be defined for a mixture as m/n and V/n, where $n = \Sigma n_i$. These quantities are called the mean molar mass and the mean molar volume respectively.

(b) from *"Electromagnetic radiation"* table *(Section 2.7, p. 29).*

Name	*Symbol*	*Definition*	*SI unit*	*Notes*
transmittance, transmission factor	τ, T	$\tau = \Phi_{tr}/\Phi_0$	I	6
absorptance, absorption factor	α	$\alpha = \Phi_{abs}/\Phi_0$	I	6
reflectance, reflection factor	ρ	$\rho = \Phi_{ref1}/\Phi_0$	I	6
(decadic) absorbance	A	$A = -\lg(1-\alpha_i)$	I	7
napierian absorbance	B	$B = -\ln(1-\alpha_i)$	I	7
absorption coefficient				
(linear) decadic	a, K	$a = A/l$	m^{-1}	8
(linear) napierian	α	$\alpha = B/l$	m^{-1}	8
molar (decadic)	ϵ	$\epsilon = a/c = A/cl$	$m^2\ mol^{-1}$	8, 9
molar napierian	κ	$\kappa = \alpha/c = B/$	$m^2\ mol^{-1}$	8, 10
absorption index	k	$k = \alpha/4\varkappa\nu$	I	
complex refractive index	$\hat{n}$	$\hat{n} = n + ik$	I	

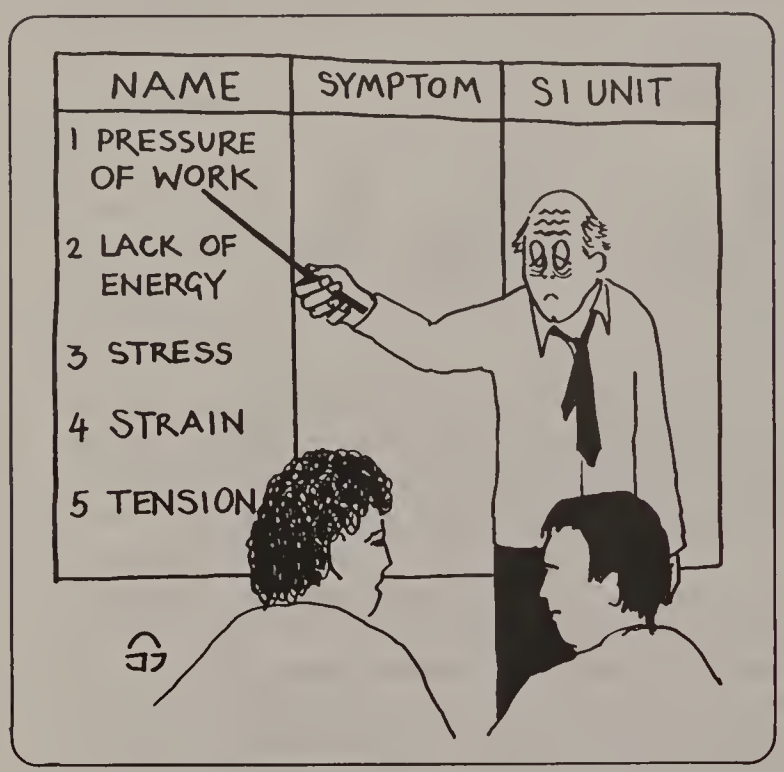
(6) If scattering and luminescence can be neglected, $\tau+\alpha+\rho=1$. In optical spectroscopy internal properties (denoted by a subscript i) are defined to exclude surface effects and effects of the cuvette, so that if scattering and luminescence can be neglected $\tau_i+\alpha_i=1$. This leads to the customary form of the Lambert–Beer law $\Phi_{tr}/\Phi_0(=I_{tr}/I_0)=\tau_i=1-\alpha_i=\exp(-\kappa cl)$.
(7) The definitions given here relate the absorbance A or B to the internal absorptance α_i; see note (6). However the subscript i on the absorptance α is often omitted.
(8) l is the absorbing path length, and c is the amount (of substance) concentration.
(9) The molar decadic absorption coefficient ϵ is frequently called the 'extinction coefficient' in published literature. Unfortunately numerical values of the 'extinction coefficient' are often quoted without specifying units; the absence of units usually means that the units used are $mol^{-1}\ dm^3\ cm^{-1}$. See also [20]. The word 'extinction' should properly be reserved for the sum of the effects of absorption, scattering and luminescence.
(10) κ may be called the molar absorbance cross-section, and κ/N_A the cross-section per molecule, denoted σ, this terminology is more common in physics than chemistry.

(c) from *"Conversion tables for units" (Section 7.2, p.105).*

Name	*Symbol*	*Relation to SI*
force, F		
newton (SI unit)[1]	N	$=kg\ m\ s^{-2}$
dyne (esu, emu, Gau)	dyn	$=g\ cm\ s^{-2}=10^{-5}$ N
au of force	E_h/a_0	$\approx 8.238\ 73 \times 10^{-8}$ N
kilogram-force	kgf	=9.806 65 N
energy, U		
joule (SI unit)	J	$=kg\ m^2\ s^{-2}$
erg (esu, emu, Gau)	erg	$=g\ cm^2\ s^{-2}=10^{-7}$ J
hartree (au)	E_h	$=\hbar^2/m_e a_0^2 \approx 4.359\ 75 \times 10^{-18}$ J
rydberg	Ry	$=E_h/2 \approx 2.179\ 87 \times 10^{-18}$ J
electronvolt	eV	$=e \times V \approx 1.602\ 18 \times 10^{-19}$ J
calorie, thermochemical	cal_{th}	=4.184 J
calorie, intemational	cal_{IT}	=4.1868 J
15°C calorie	cal_{15}	≈4.1855 J
litre atmosphere	1 atm	=101.325 J
British thermal unit	Btu	=1055.06 J

(1) 1 N is approximately the force exerted by the earth upon an apple.

Among other new additions are a table of standard atomic weights of the elements (1985 revision), a table of properties of the nuclides (atomic mass, abundance, nuclear spin, magnetic moment and quadrupole moment), an extensive table of conversion factors from non-SI units to SI units (see table for an example), and a complete index of all the 522 symbols listed in the book, for both physical quantities and units.



The Abbreviated List of the Green Book, prepared for publication by Prof. Klaus Homann for Commission I.1, is a four-page laminated card (A4 size, being a folded A3 sheet). It is intended as a ready reference to the symbols and units most frequently used by authors, teachers and students in chemistry and related disciplines. It is a compact abstract of the Green Book, arranged as tables of SI units, recommended symbols, non-SI units in current use with conversion factors, and the values of fundamental constants. This list will be useful in classrooms, study rooms and laboratories.

"Commission I.1 welcomes comments, criticisms and suggestions on these publications and on its activities."

Besides these efforts toward publication of manuals, Commission I.1 is also working actively to promote dissemination of IUPAC recommendations on symbols, terminology and units to the world chemical community in every possible way. The Green Book and its Abbreviated List will be translated shortly into many different languages. The commission welcomes comments, criticisms and suggestions on these publications and on other activities.

Green Book test

Can you answer the following questions?

1. What is quantity calculus? How is it used in equations, tables and figures, and for the conversion of units?
2. What is improper in saying "the number of moles" in the sense of "amount of substance"?
3. How do you avoid such awkward expressions as "the amount of substance of molecular oxygen"?
4. What is the current definition of the metre?
5. What are the definition, recommended symbol, and SI unit of the quadrupole moment of a molecule?
6. What is the SI unit of the Einstein coefficient of stimulated emmission?
7. What are the atomic units of time and velocity? What is the velocity of light in atomic units?
8. A molar susceptibility is quoted as "—15 cgs ppm"; what is the corresponding value in SI units?

If you cannot asnwer these questions, please see the Green Book. (*Editor:* If you can answer them, write them down on a postcard and send them to Prof. Kuchitsu.)

References

1. McGlashan, M. L., 1969. *Manual of symbols and terminology for physicochemical quantities and units.* Pergamon Press, Oxford.
2. *ISO Standards Handbook 2, Units of Measurement,* ISO Central Secretariat, Case Postale 56, Geneve 20, Switzerland, 1982.

News & Views

Granting of IUPAC sponsorship to symposia

IUPAC sponsors about 30 symposia (conferences, congresses etc.) throughout the world each year. In order to apply for sponsorship, symposia organizers first approach the IUPAC Secretariat in Oxford to obtain an Advanced Information Questionnaire (AIQ). This four page questionnaire is divided into 13 sections:

1. Title of symposium. Details of subsections; parallel sessions and main subject areas in chemistry covered by symposium.
2. Aims, purposes and themes of symposium. Special contributions to the advancement of international chemistry.
3. Proposed location and dates of symposium.
4. Approximate number of scientific participants expected
5. Proposed registration fees. **IUPAC sponsorship requires that its affiliate members are entitled to 10% reduction or "own' members" rate on the registration fee for scientific participants.**
6. Availibility of low cost hotel or dormitory accommodation.
7. Exhibitions. IUPAC sponsorship requires that its main official publisher, Blackwell Scientific Publications, shall be allowed to display the publications of the union free of charge.
8. Granting of visas. **IUPAC sponsorship implies that entry visas will be granted to all *bona fide* chemists provided application is made not less than three months in advance.** If a visa is not granted one month before the meeting, the IUPAC Secretariat should be notified without delay by the applicant.
9. Co-sponsorship.
10. Publication rights. IUPAC reserves the right to publish in its official journal *Pure and Applied Chemistry* (or in book form) the whole or part of the proceedings of any symposium which it sponsors.

    Proposed scientific programme: names of plenary lecturers, lecture titles, details of other contributions.
11. International Advisory Committee/Local Organising Committee.
12. Proposed symposium editor.
13. Details of chairman and secretary of local organizing committee.

Organizers of a symposium are required to return the AIQ preferably TWO YEARS BEFORE THE ACTUAL MEETING. The latest permitted date for receipt of a completed questionnaire by the Union is 12 months in advance.

Having completed the AIQ, the organizers return it to the Secretariat who then forward it to the appropriate IUPAC division president. The division president determines whether the scientific programme of the symposium is of the high standard commensurate with the granting of IUPAC sponsorship.

At its meeting in Moscow in May 1988, the Executive Committee reviewed the Union's policy concerning deadlines for granting of IUPAC sponsorship to symposia.

Secretary General Tom West reported that since the Boston General Assembly in August 1987, a number of completed AIQs had been received belatedly. In one case it was decided not to grant sponsorship. After reviewing the matter carefully, the Executive Committee reaffirmed the Union's policy as being:

(i) no symposium can be considered as sponsored officially unless it had gone through the necessary procedures, the first step being to obtain an AIQ from the IUPAC Secretariat;
(ii) the symposium organizers should preferably return to IUPAC a completed AIQ two years before the actual meeting (even if details of plenary/invited lectures are not then definite);
(iii) the latest permitted date for receipt of a completed AIQ by IUPAC is 12 months in advance.
(iv) the latest permitted date for granting sponsorship is six months in advance.

The intention behind the policy is to give credibility to sponsorship by the union, and to ensure that IUPAC's policy on entry visas is publicized in symposia second circulars, distributed no later than six months in advance. After confirming via the relevant Division President(s) that a symposium is of a high scientific standard, the granting of sponsorship should not be delayed unduly by publication considerations. Where necessary, provisional publication responsibilities is accepted by IUPAC, with a final decision to be made later.

Sponsorship policy on deadlines considered by Executive Committee

When the Executive Committee met at the Presidium of the Academy of Sciences of the USSR, Moscow, May 1988, it considered the deadline for granting of IUPAC sponsorship to symposia. The Union's sponsorship policy aims to give credibility to sponsorship by the Union, and to ensure that IUPAC's policy on entry visas is publicized in symposia second circulars, distributed no later than six months in advance.

Shipment of chemicals

International trade in chemicals is growing and is expected to continue to grow in the coming years. Many of the traded chemicals are banned or severely restricted in one or more countries, but are often relatively unregulated in importing countries - particularly developing countries. The potential environmental consequences of the shipment of these chemicals demand that countries receiving shipments are fully aware of what they are receiving and that they agree to their entry into their territories.

In various forums, a number of governments have called for adoption of an international system incorporating the principal of *prior informed consent* (PIC), so that prior to the shipment of chemicals, recipient countries would be fully aware of what they are receiving before they agree to their import.

A number of governments have called for adoption of an international system whereby, prior to the shipment of chemicals, recipient countries would be fully aware of what they are receiving before they agree to their import.

London Guidelines

On 17 June 1987, the Governing Council of the United Nations Environment Programme (UNEP) adopted the *London Guidelines for the Exchange of Information on Chemicals in International Trade.* This decision was published as a booklet: *Environmental Law Guidelines and Principles.* Vol. 10: "Exchange of Information on Chemicals in International Trade".

These guidelines established a global information exchange network in the chemicals field, but they lacked an explicit PIC mechanism. The UNEP Governing Council therefore authorized the Executive Director of UNEP to convene a working group of experts to develop modalities of PIC and other approaches which could usefully supplement the guidelines and to recommend ways of incorporating the principle of PIC into the guidelines.

Accordingly, a UNEP ad hoc Working Group of Experts on Prior Informed Consent and Other Modalities to Supplement the London Guidelines for the Exchange of Information on Chemicals in International Trade was set up and met for its first session in Dakar, Senrgal, 19-23 September 1988.

As a background paper for this group, a "Summary of international activities in the area of exchange of information on chemicals in international trade including an identification of gaps, overlaps and national needs" was prepared by the UNEP Secretariat. The paper included reference to the *General Agreement of Tariffs and Trade* (GATT); the UNEP *International Register of Potential Toxic Chemicals* (IRPTC); the World Health Organization *WHO Recommended Classification of Pesticides by Hazard* and the *International Programme on Chemical Safety.*

International "red flag" list of banned or several restricted chemicals

The group considered a proposal for the development of an internationally agreed "red flag" list of chemicals for which each country would have the right to apply PIC. Thus, no export of a chemical on that list could take place without the prior written consent of the competent national authority in the importing country. Chemicals would be placed on this red flag list when they have been banned or severely restricted by at least five countries.

The list would be established by government experts with input from competent international organizations and then circulated to all governments, together with information about the chemicals, including, if possible, risk-benefit analyses under local conditions, maximum permissible residue levels of the chemical in export products, and information about substitutes and alternatives.

For further information on the "Exchange of Information on Chemicals in International Trade" write to: UNEP, PO Box 30552, Nairobi, Kenya.

Sugar scale and polarization method

At the 19th Session of the International Commission for Uniform Methods of Sugar Analysis (ICUMSA) held in Cannes, France, 25-26 May 1986, important changes were made to the definition of the International Sugar Scale and the method of reporting polarization analyses. These changes became effective on 1st July 1988.

The main features of the changes and the reasons for these are:

- With the development of improved methods for production and analysis of pure sugar, the optical rotations which are the basis of the International Sugar Scale have been determined more precisely.
- ICUMSA agreed the validity of these new measurements and recommended that they form the basis of the International Sugar Scale with effect from 1st July 1988. Polarizations on the scale in force prior to that date were reported in °S; to avoid confusion, values on the new scale will be reported in °Z.
- The magnitude of the change is small, such that a polarization of 100°S on the old scale is equivalent to 99.97°Z on the new scale.
- In future, quartz plates used to standardize polarimeters and saccharimeters will be calibrated by metrological authorities in °Z. However, it is unnecessary to submit older plates for recalibration; it is only necessary to multiply the certificated calibration recorded in °S on the old scale by 0.099971 to obtain the correct °Z of the plate applicable to the new scale. Similarly, any correct polarization in °S if multiplied by the factor 0.99971 will be converted into the correct polarization in °Z.
- It is not anticipated that any further changes in the International Sugar Scale will be required within the foreseeable future.
- Deduction of 0.1°S from raw sugar polarizations, which has been an option adopted by some countries is no longer ratified by ICUMSA.

Further information from Dr M. R. Player, President, Central Laboratory, CSR Ltd, 70 John Street, Pyrmont 2009, Australia. Tel: +61 (2) 692 7508; Telex: AA70924; Fax: +61 (2) 692 8275.

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New honour for Rao

Past-President Prof. C. N. R. Rao of the Indian Institute of Science has been elected Foreign Member of the Polish Academy of Sciences.

On the road to Stockholm

Two thousand chemists are expected to invade Stockholm at the beginning of August. They will be making their way by road, rail, sea and air to the Stockholm International Convention Centre in the hope of experiencing a chemical cocktail of biological macromolecules, marine solutions, chemically communicating organisms, low-dimensional solids, superconducting organic materials and bile acids. This special cocktail has been named "32nd IUPAC Congress". for more information on this enticing elixir see page 30

Burn-ups

A **burn-up** is an induced nuclear transformation of atoms during reactor operation. The fraction of an initial quantity of a given nuclide that has undergone burn-up is called the **burn-up fraction.** A **specific burn-up** is the total energy released through induced nuclear transformations divided by the mass of a nuclear fuel.

These three definitions are taken from the *Compendium of Chemical Terminology: IUPAC Recommedations,* compiled by Victor Gold, Kurt L. Loening, Alan D. McNaught and Pamil Sehmi and published by Blackwell Scientific Publications, Oxford, UK, 1987. viii + 464 pp. (Hardback) IBSN 0-632-01765-1 price £39.50: (paperback), 0-632-01767-8 price £24.50 (see September 1987 issue of *CI*, pages 189-191).

Letter to the Editor

Name for *n* symbol for relative mass

Sir,

In the excellent new edition of *Quantities, Units and Symbols in Physical Chemistry*[1], the members of the Commission on Physicochemical Symbols, Terminology and Units recommend that the phrase "amount of substance of X" be abbreviated to "amount of X". Their motive is a laudable one. The full phrase is very awkward, and a shorter term would certainly be preferable.

I do not think there is any doubt, however, that this proposal will create difficulties at an introductory level. Even now, students tend to confuse "amount of substance" with the "amount" of a substance in the ordinary sense of its mass or its volume. Indeed, M. J. Frazer and D. M. Servant's study of the methods students use for carrying out stoichiometric calculations[2] found that many of the students tested used the word "amount" in the colloquial sense, and not one of them used the word in the technical sense.

This problem has been felt by teachers on both sides of the Atlantic, and a number of alternative names for *n* have been suggested. However, most of these are unsatisfactory, either because they fail to distinguish between *n* and the number of entities, *N* (e.g. "cardinality", "ontcount", "particulality"), or because they break the rule that the name for a physical quantity should not imply a particular choice of unit (e.g. "molar amount", "moleage"). Of all the suggestions that have been made, I think much the best is G. Gorin's "chemical amount"[3]. This is descriptive, easy to say, uses familiar words, and does not require a major change in IUPAC recommendations. Indeed, IUPAC can continue to recommend "amount" as the abbreviated name; it has only to allow this to be amplified to "chemical amount" wherever confusion with "amount" in the ordinary sense is liable to occur.

A further difficulty that students have is differentiating between the relative mass of an entity, M_r (=18.02 for H_2O), and its molar mass, M (=18.02 g mol^{-1} for H_2O). To overcome this problem, Frazer and Servant suggested that only the latter quantity be taught in schools. However, this is not an ideal solution, since the quantity that is actually measured is relative atomic mass, and it is this quantity that is tabulated in standard texts.

An alternative solution is to give to relative mass the more distinct and rational symbol m_r (m is the standard symbol for mass), and to formulate the relationship between molar mass and relative mass explicity as

$$M = M_\theta m_r$$

where M_r = 1 g mol^{-1}. The latter is equal to the product of the Avogadro constant and the unified atomic mass constant (= 1/12th of the mass of a ^{12}C atom), and is called by IUPAC the "standard molar mass" (*Quantities, Units and Symbols in Physical Chemistry,* p. 86). This formulation is particularly useful when M has to be in kg mol^{-1}, as in some physicochemical calculations, since the need to insert a value for M_θ (in this case 0.001 kg mol^{-1}) helps to ensure that the appropriate units are used.

I have put the above suggestions to Prof. Ian Mills, Chairman of the Commission, and he is sympathetic to them, provided that they receive support from a sufficient number of chemists throughout the world. I sould be very grateful if readers who would like to see such changes would write to Prof. Mills at the Department of Chemistry, University of Reading, UK, to express their support for them. If they can promote them in other ways, I should appreciate this also. I believe that these changes would greatly facilitate the teaching of stoichiometry, especially at an introductory level.

Dr P. G Nelson
The University, Hull
UK

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Affiliate Affairs

This new section in *Chemistry International* is devoted to affiliate affairs. It contains news about affiliates and the affiliate membership scheme and hopefully, in the future, will include contributed items from affiliates.

We would be delighted to hear from you

Affiliate members, where are you? asked Secretary General Tom West in his column in the previous issue of *CI* (page 220 of the November 1988 issue).

He pointed out that prior to 1986, there was no way in which chemists could voluntarily become associated with the international scientific union that represents their affairs world-wide. Before 1986, the number of countries involved in any way with IUPAC was only about 40. Now there are 92 countries involved and, together with the members of commissions, divisions and standing committees and so on, there is an involvement of some 9000 chemists in IUPAC.

As an affiliate, why not expess your views? aked West. It is your right to do so. The Secretary General said thet he would like to ask each affiliate to make a serious attempt to recruit at least one other new member in support of the union and for the good of chemistry as a whole. Meanwhile, he added, many of us would like to hear a lot more from affiliates in the correspondence column on the affairs of IUPAC and more generally in relation to your views on its future activities.

We would be delighted to hear from you on this or any other matter related to our union, said West. Given sufficient support we could have a regular affiliate affairs page.

How can affiliates contribute?

At the time of writing (88.09.26) a yellow leaflet is being sent to national chemical societies for distribution to chemists throughout the world. The leaflet describes IUPAC and its activities and invites chemists to become IUPAC affiliates. The benefits of IUPAC affiliation listed in the leaflet include the following:

1. Affiliates become visible as potential recruits for the scientific work of IUPAC. The names and addresses and other details of affiliates who express an interest in the work of a commission will be submitted to that commission at the beginning of next year. Already, some affiliates have been recruited on to commissions, subcommittees and working groups (see page 96 of the May 1988 issue of *CI*).
2. Affiliates may communicate directly on scientific matters with the officers of IUPAC commissions. A list of names, addresses and telephone numbers of commission officers was published in the November 1987 issue of *CI*. Many commissions are always on the look out for input to and comments on their projects by experts in the appropriate fields of expertise. This particularly applies in the early stages of the work of commissions. Much of this work is done by correspondence.
3. Affiliates are encouraged to make contributions to *Chemistry International (CI)*. These contributions may take several forms: for example, letters to the editor; brief news items relating to IUPAC activities (e.g. participation at a IUPAC-sponsored conference) - preferably accompanied by a black and white photograph; cartoons; anecdotes and short humorous items (e.g. "What does IUPAC stand for?" Answer: International Union of Paper, Agenda and Confusion.)

Slight decrease in affiliate numbers

The total number of affiliates in 1988 was 7503 compared to 7859 in 1987. (see table). This represents a drop of approximately 4.5%. Several factors may have contributed to this fall:

1. Increases in subscription charges. For example, in the USA, the affiliate subscription increased from USD 15.00 in 1987 to USD 20.00 in 1988.
2. Leaflets promoting the affiliate scheme in 1986 and 1987 were distributed widely throughout the world whereas the scheme was not promoted in 1988. Leaflets are currently being sent

Affiliate numbers 1987 and 1988

Country	1987	1988	Country	1987	1988
Afghanistan	1	1	Malaysia	62	31
Algeria	4	3	Malta	1	0
Arab Republic of Egypt	25	28	Mexico	1	3
Argentina	31	23	Morocco	5	5
Australia	1	7	Mozambique	20	28
Austria	4	3	Nepal	1	0
Bahrain	3	2	Netherlands	37	40
Bangladesh	0	25	New Zealand	22	18
Belgium	1	2	Nigeria	1	3
Bhutan	0	1	Pakistan	2	1
Bophutatswana	0	1	Panama	31	35
Botswana	1	2	Papua New Guinea	25	25
Brazil	25	13	Paraguay	1	0
Bulgaria	15	15	Peru	40	48
Cameroon	26	27	Philippines	21	25
Canada	3	55	Poland	0	1
Central African Republic	1	0	Portugal	12	16
Chile	27	35	Qatar	1	1
China/Beijing	24	24	Rep. of Korea	19	22
China/Taiwan	4	3	Rep. of South Africa	240	265
Colombia	17	32	Romania	1	0
Cuba	1	26	Rwanda	25	32
Cyprus	1	1	Saudi Arabia	3	2
Czechoslovakia	244	235	Senegal	1	0
Denmark	26	29	Singapore	34	38
Ethiopia	36	28	Spain	1	50
Federal Republic of Germany	42	38	Sri Lanka	22	26
Fiji Islands	1	1	Sudan	2	2
Finland	0	11	Swaziland	0	1
France	127	68	Sweden	10	10
Ghana	24	25	Switzerland	15	17
Guatemala	0	1	Tanzania	1	1
Guinea	1	0	Thailand	26	43
Guyana	0	1	Trinidad	1	0
Hungary	10	10	Tunisia	4	4
India	45	17	Turkey	81	98
Indonesia	25	64	Uganda	0	1
Ireland	5	14	UK	428	338
Iraq	4	4	Uruguay	15	15
Israel	0	1	USA	5125	4653
Italy	146	125	USSR	44	120
Jamaica	1	1	Venezuela	1	1
Japan	416	349	Vietnam	1	0
Jordan	7	5	Yemen	4	24
Kenya	27	28	Yugoslavia	1	3
Kuwait	18	22	Zaire	11	12
Lao PDR	1	3	Zambia	4	2
Lebanon	1	2	Zimbabwe	4	7
Lesotho	0	1			
Libya	1	2	Total no. of affiliates	7859	7507
Luxembourg	1	1	Total no. of countries	90	91
Malawi	25	25			

out by the Secretariat in Oxford to promote the scheme in 1989.

3. There have been suggestions that some affiliates may have become disillusioned with the scheme. If this is the case we would appreciate some direct feedback from affiliates.

The participation of chemists from Third World countries in the affiliate scheme continues to be encouraging. In 1988, 821 chemists from 52 Third World registered as affiliates. This compares with just over 700 chemists from 52 Third World countries in 1987 (see page 84, May 1988 issue of *CI*). The affiliate memberships of many of these chemists are being made available free as a result of funds made available by IUPAC to assist young Third World chemists to join the scheme in 1988 and 1989.

Ecuador joins affiliate membership scheme

Ecuador has joined the affiliate membership scheme. Prof. Juan Andrés Llauger, the National Affiliate Membership Secretary in Ecuador, has submitted the names and addresses of six young chemists to be enrolled as IUPAC affiliates in 1989. These sponsored memberships were made possible as a result of funds made available by IUPAC to assist young chemists in developing countries.

Juan Llauger is Head of the Chemistry Department at the Pontificia Unversidad Catolica del Ecuador, Quito. In March 1988 he paid visit to the UK including the University of Surrey, Guildford where he met the IUPAC Affiliate Affairs Secretary, Dr Michael Freemantle and also Dr Angela Danil de Namor - who is an Associate Member of the Commission on Solubility Data.

Prof. Juan Andrés Llauger.

Michael Bowen visits Oxford

On the 12th July 1988, USA National Affiliate Membership Secretary Dr D. H. Michael Bowen visited the IUPAC Secretariat in Oxford for discussions with Affiliate Affairs Secretary Dr Michael Freemantle. He was also in Oxford to attend the meeting of the IUPAC Committee on Publications. Bowen succeeded Justin W. Collat as Director of the American Chemical Society Membership Division on 2nd May 1988.

In June, the IUPAC Secretariat welcomed Mrs Gill Crook as a new member of staff. Mrs Crook is responsible for loading affiliate details from the blue registration forms onto the affiliate computer database. Her pervious appointment was with the United Kingdom Atomic Energy Authority (UKAEA), Harwell, Oxfordshire.

Science in Siberia

In May 1988, following their meeting in Moscow, members of the Executive Committee were invited by the USSR Academy of Sciences to visit the Novosibirsk Science Centre in Siberia.

The natural and climatic conditions of Siberia are severe. In winter (above) the temperature can drop as low as -60° C. Two thirds of Siberia are in the permafrost zone (right).

According to IUPAC President, Prof. Valentin Koptyug, the bowels of the Siberian earth contain practically all the elements of the periodic table. Almost three quarters of the USSR's known mineral, fuel and energy resources are concentrated in Siberia. Not only are one half of the world's coal deposits to be found in the region, but there are also diamonds, gold, iron, copper and nickel ores as well as other minerals.

The natural and climatic conditions of this vast territory are extremely severe. In winter the temperature in some places drops to -60° C and two thirds of Siberia are in the permafrost zone. The average winter temperature is about -22° C. In summer the temperature averages +20° C although the highest temperature ever recorded was +48° C. The region accounts for one fifth of the world's forests and contains more than 50 000 rivers.

Siberia covers ten million square kilometres. Although it is rich in mineral resources and offers splendid prospects for development, it is sparsely populated. Mineral deposits are often located thousands of kilometres from the country's industrial

Executive Committee meeting in Moscow

Secretary General Prof. Tom West reported on the Executive Committee meeting in Moscow in his Secretary General's Column which appeared on pages 217-221 of the November 1988 issue of *CI*.

centres. On top of all this there is a shortage of labour resources in the region. All these factors create tremendous difficulties in the economic development of Siberia and present complex problems.

To solve these problems, vast material and labour inputs are required and the development of this territory demands solid scientific backing.

Novosobirsk Science Centre

At 11.35 pm on Tuesday 17th May, the Executive Committee left Moscow on their flight to Novosibirsk. Four hours later, at 7.35 am on Wednesday 18th of May, they arrived at Novosibirsk. Novosibirsk is four hours and four time zones away from Moscow.

The city, which was founded in 1893, is the capital of Siberia. It has 1.5 million inhabitants and is the fifth largest city in the USSR.

Following their arrival, the committee were taken to a new academic town, Akademgorodok, about 30 kilometres south of Novosibirsk. The town is now a suburb of more than 100 000 people and some 20 scientific institutes. The latter form the Novosibirsk Science Centre which is one of six science centres in Siberia.

Novosibirsk Science Centre is the largest in the Siberian Division of the USSR Academy of Sciences. Construction of Akademogorok started in 1957 just after the government decision to establish the Siberian Division of the USSR Academy of Sciences was adopted.

IUPAC President Prof. Valentin Koptyug is Vice-President of the Academy of Sciences of USSR and President of the Siberian Branch of the Academy of Sciences of the USSR. He became an Academician in 1979. He was Rector of Novosibirsk State University from 1978 to 1980

Koptyug's research interests include mechanisms of organic reactions, carbonium ion chemistry, spectroscopy and computer applications in chemistry and chemical education.

Visits to scientific research institutes

After a brief rest in their hotel, Prof. Koptyug welcomed the committee to the Novosibirsk Science Centre. Their three-day stay included visits to the Institute of Catalysis, Institute of Automation and Electrometry, Institute of Chemical Kinetics and Combustions, and Novosibirsk Institute of Organic Chemistry.

Academician Lavrentyev Avenue — the main street of Novosibirsk Akademogorodok. Mikhail Lavrentyev was the first Chairman of the Siberian Division of the USSR Academy of Sciences.

◄ **Dr Mary Good (right) discusses recent developments in catalysis with staff at the Institute.**

► **Members of the Executive Committee visit the Institute of Catalysis.**

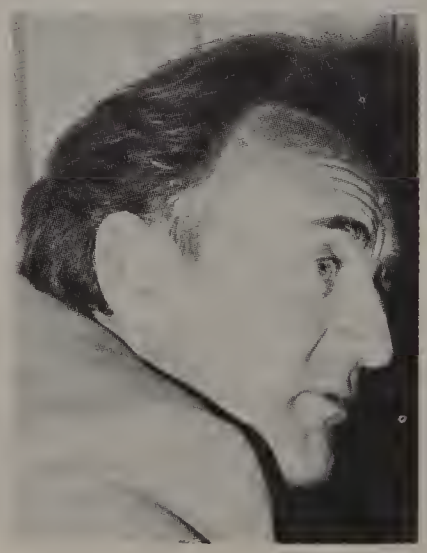
The Executive Committee were introduced to the work of the Institute of Catalysis by its director Prof. Kiril Zamaraev. Prof. Zamaraev is President of IUPAC's Physical Chemistry Division. He described a number of research projects at the institute. These include the development of a general theory of heterogeneous and homogeneous catalysis and catalysis by enzymes; prediction of catalytic action; development of fundamentals for catalyst preparation; development of catalysts for new applications; research in the field of the kinetics of catalytic reactions and mathematical simulation of chemical reactors.

The committee then visited the Institute of Automation and Electrometry where its director, Prof. Peter E. Tverdokhleb, showed the visitors examples of its work on laser technology. He explained that the institute is studying the physics of non-linear phenomena; computerization of scientific research, fundamentals of optical memory, optical techniques for data processing and the development of physical principles for measurements and measuring instruments.

The director of the Institute of Chemical Kinetics and Combustion, Prof. Yuri Molin, who is a titular member of the Commission on Chemical Kinetics, described the work of the institute. Its projects included the investigation of elementary processes and mechanisms of chemical conversions with the use of theoretical physics and novel physical techniques; study of the mechanism of combustion processes in a gas and condensed phases, generation and propagation of artificial aerosols; and the development of techniques for the synthesis of organic compounds with conjugated bonds.

At the Novosibirsk Institute of Organic Chemistry, deputy director Dr Georgeii Furin outlined the major scientific trends of the institute. These include the study of various aspects of the chemistry of aromatic and heterocyclic compounds and investigation of natural compounds. The institute has won recognition as a leading body in studying fine mechanisms of aromatic compound reactions.

The established structural features and regularities of transformations of carbocations as well as a quantitative theory of molecular regrouping have largely contributed to the understanding of important industrial processes of aromatic compounds processing. One of the original trends in the institute's research is the chemistry of fluoroaromatic compounds which have a number of unique



Prof. Yuri Molin, director of the Institute of Chemical Kinetics and Combustion and titular member of the Commission on Chemical Kinetics.

properties and features. They are non-toxic, non-combustible, and possess radiation and thermal stability. Some of the polyfluoroaromatic products developed at the institute are commercially available.

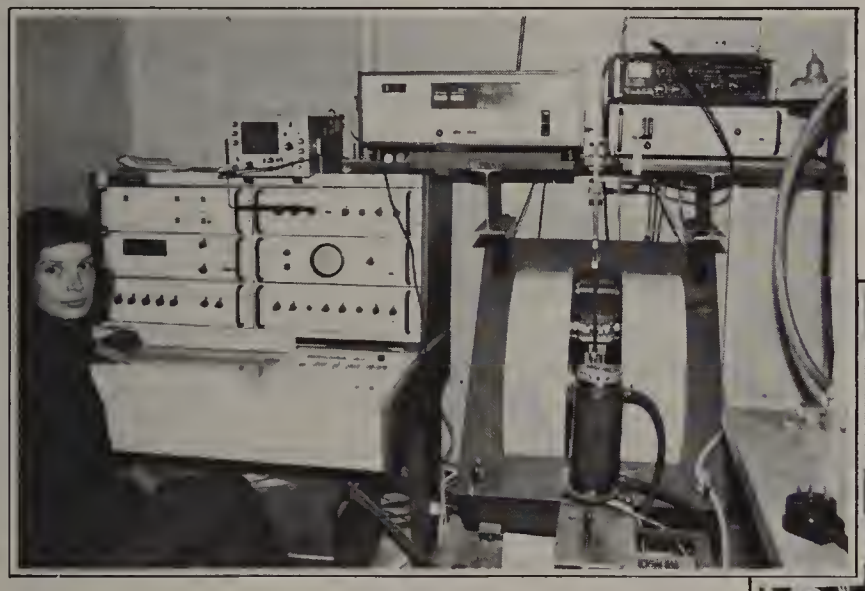
The institute is also actively involved in developing computer applications in chemistry. Koptyug, who is a member of staff at the institute, is responsible for the largest computerized spectroscopic database in the Soviet Union. His group has created spectral databases for IR, NMR, mass spectrometry and UV/visible spectroscopy. To help in the work of taking published data and converting it to computer-readable form, Koptyug's laboratory has developed an automatic digitizer that uses a television-like scanning device.

The laboratory is also in the process of creating a large database of chemical structures as part of a joint project with groups in Moscow and the German Democratic Republic. They hope to have a structure-searchable database of the millions of chemicals that appear in the scientific literature of the Soviet Union and other socialist countries.

Michael Freemantle

Koptyug's laboratory has created, designed and built a digitizer called "Graph". The apparatus has a simple pentype device which allows a chemist to "draw" a chemical structure quickly and easily. The encoding device allows one to enter 20-25 structures per hour.

Reactivity of solids



ESR spectroscopy is used to study mechanical treated organic and inorganic salts at the Institute of Solid State Chemistry (left).

Prof. Vladimir Boldyrev (right), Director of the Institute, who was Chairman of the International Conference on Contemporary Problems on Reactivity of Solids.

The International Conference on Contemporary Problems on Reactivity of Solids was held from 1st to 4th September 1988 in Academic City (Akademgorodok), Novosobirsk. The conference was organized under the chairmanship of Prof. Vladimir Boldyrev, Director of the Institute of Solid State Chemistry, Siberian Branch of the Academy of Sciences of the USSR. The conference was the first in a series of conferences on this topic.

The conference emphasized the distinctive features of the science of solid state reactions, recognized as an identifiable discipline. Particular emphasis was placed on topochemistry, the geometrical controls on reaction rates and the signi-

ficance of Arrhenius parameters for these types of rate processes, including decompositions of solids and crystolysis reactions.

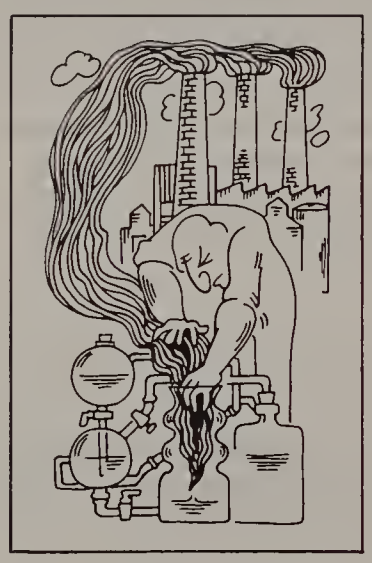
About 100 scientists attended the conference. These included well-known contributors to the field of solid state science from all parts of the Soviet Union. The host institute was also well represented. About a dozen invited speakers participated including representatives from Czechoslovokia, DDR, France, FRG, Poland, Switzerland, UK and USA.

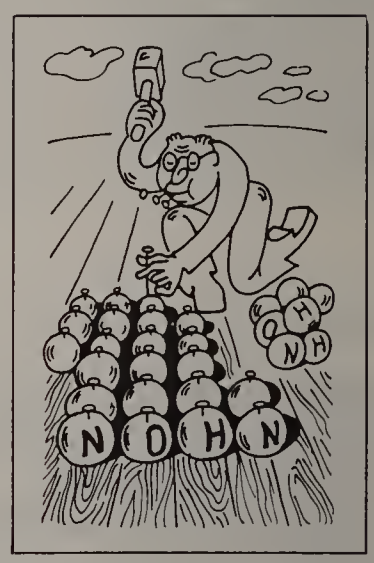
Discussions were wide-ranging. A most welcome feature of the organization was the continuation of discussions without curtailment. The most significant conclusions were that more precise definitions were required for some of the subject terms such as topochemistry, nucleus, etc.

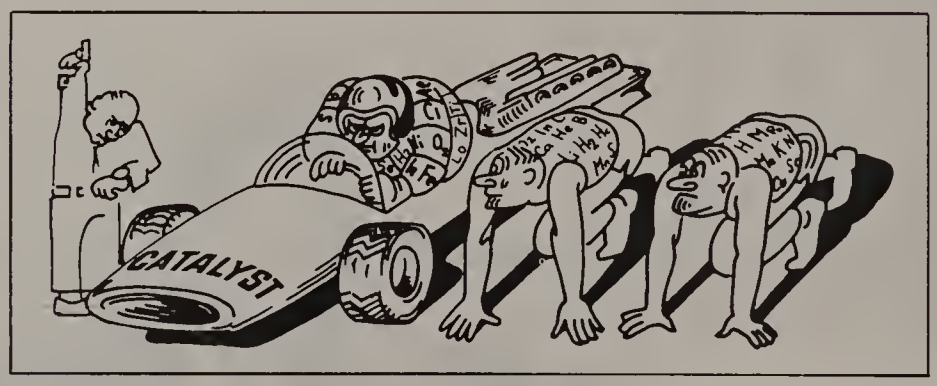
Andrew K. Galway
The Queen's University of Belfast
Northern Ireland

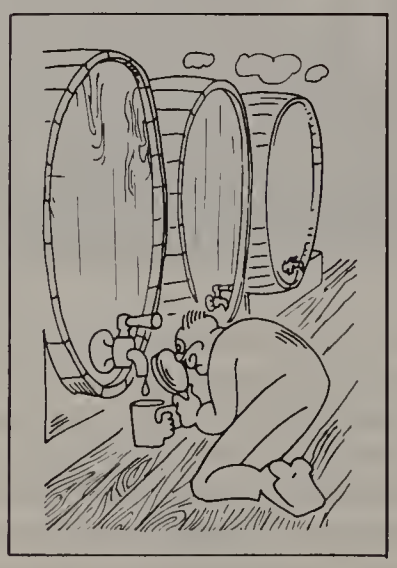
Humour: the universal catalyst

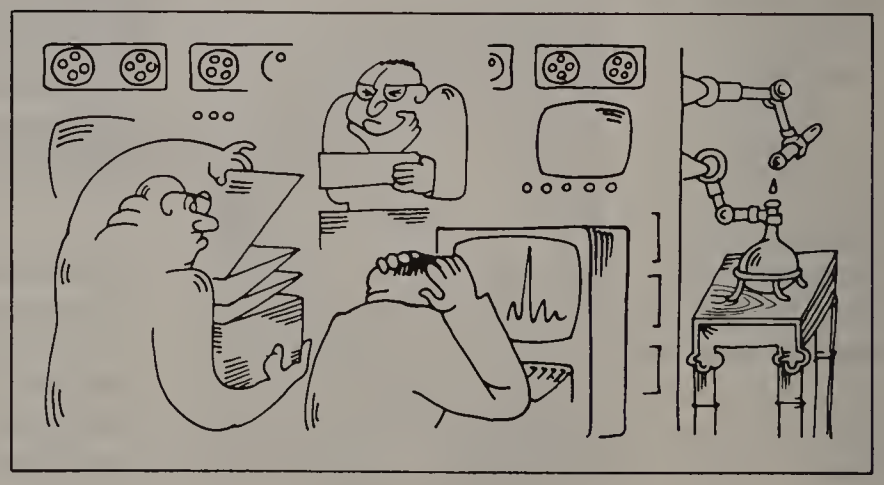
The six cartoons below are taken from the book *Institute of Catalysis*. The book describes the nature and importance of catalysis and includes coloured illustrations of the Institute of Catalysis of the Siberian Division of the USSR Academy of Sciences and its various activities in the field of catalysis. The cartoons are published courtesy Vneshtorgizdat. 1982.











Commission & Committee News

Computer database distribution

At its meeting at Bolzano, Italy on 20 May 1988, the IUPAC Committee on Chemical Database (CCDB) discussed the status of proposals from organizations wishing to market IUPAC computer readable products, of which the ENTVAPOR database of enthalpies will be the first. A contract with one company was expected to be signed by the end of 1988. Other computer projects were also discussed, including the conductance and pesticide databases.

The committee has written and submitted to *CI* for publication, two articles on computer topics, the Beilstein and Gmelin computerization activities and chemical structure searching on a personal computer (to be published in a forthcoming issue of *CI*). Work is continuing on a *Glossary of Computer Terms for Chemists* and *Guidelines for Computerized Databases*.

Other items discussed included the creation of a standard structure distribution format of chemical structure representations (that is, connection tables) for IUPAC. This matter is currently under discussion in a number of countries, and CCDB plans to bring together a number of groups who have been working in this area.

There was a discussion regarding the standardization of acronyms for physical quantities used in computer databases and systems. This matter needs to be discussed with the Commission on Physicochemical Symbols, Terminology and Units (I.1).

The Committee agreed to support the application of Prof. M. Marsili for IUPAC sponsorship of the 9th International Conference on Computers in Chemical Research and Education (ICCCRE) to be held at Lake Garda, Italy, 27 May - 2 June 1989.

Stephen Heller

Committee on Publications meeting in Oxford

The Committee on Publcations, with Dr Ted Becker in the chair, met in Oxford, 13-15 July 1988. At the meeting IUPAC's official publishers, Blackwell Scientific Publications, presented their report to the committee. The termination of the contract and terms of the new contract with Pergamon for the *Solubility Data Series* were also discussed by the committee.

Mr Dass Gujral, Executive Editor of *Pure and Applied Chemistry (PAC)* also presented a report to the committee. This included reference to contents, subscriptions and the impact of *PAC* on the

chemical community. Dr Steven Heller reported to the committee on the current activities and future programme of the Chemical Databases Committee.

The committee then considered the report of the Editor of *Chemistry International (CI)*. Dr Mike Freemantle pointed out that the problems of distribu-ting *CI* to affiliates over the past 18 months had now been solved.

Analytical reactions, reagents and separations

Members of Commission V.1 met for the first time under its new title, "Analytical reactions, reagents and separations" at the Berg Akademie, Freiberg, GDR, 22-26 August 1988.

Being already conditioned to change, the commission, aided by the presence of the Analytical Chemistry Division secretary Prof. G. den Boef, spent some time on the "Think tank" proposals about restructuring and found much merit in the idea put forward for method orientated and problem orientated commissions. The commission, the oldest in the division, with certain phoenix like characteristics, saw a clear central role would be left for it after shedding its working group on "Separation and chromatography".

Good progress was made on the organic analytical reagents group of projects, practical aspects of metal buffers and chemical sensors. Reports were received from the working groups on "Analytical separations" and on "Chemometrics". The latter group has just completed a major 33-chapter report on areas of current importance. Their next project will be to obtain data to test chemometric methods.

In addition to hard work, a full social, gastronomic and cultural programme was enjoyed including an excursion to Ostwald's house at Grossbothen. We were shown round and given coffee and cakes in the

The Commission on Analytical Reactions, Reagent and Separations is the oldest in the Analytical Chemistry Division and according to its secretary, Prof. Duncan Thorburn Burns, has phoenix-like characteristics. In Freiburg, it enjoyed a full social, gastronomic and cultural programme — as well as hard work. *(Photo courtesy HFBS Bergakademie Freiberg.)*

laboratory, in the old Ostwald tradition, by his grand daughter. A visit was made to the Clemens Winkler laboratory where the element germanium was discovered and the properties of indium established. The final evening was taken up with an outstanding performance by Hans-Dietier Schöne on the very large world-famous 18th century Silbermann organ in Freiberg Cathedral. The concert included classical and modern works.

The meeting also marked the retirement from the Berg Akademi of Prof. G. Ackerman, our former Chairman. However, he has not retired from research or active work with and on behalf of the commission.

The commission was entertained to meals by the Rektor of the Berg Akademie, the Director of the Chemical Department, T. H. Leuna-Merseburg and by the GDR National Committee for Chemistry. The Berg Akademie accommodation and facilities are recommended to other commissions looking for a quiet location for work with historical chemical and cultural outlets.

Duncan Thorburn Burns

Oils, fats and derivatives

The 41st meeting of the Commission on Oils, Fats and Derivatives (VI.3) was held at the University of St Andrews, Scotland, 16-18 August 1988. There were 30 delegates representing 18 countries.

The meeting was formally opened by the chairman, Dr Joyce Beare-Rogers, who spoke of "our pleasure at being in St Andrews, our indebtedness to the UK delegation for the excellent arrangements and our gratitude to Prof. Frank Gunstone for receiving us at this university". In welcoming the delegates to St Andrews, Prof. Gunstone said that the university, at which there were some 3000 undergraduates and 300 graduates, was honoured by the commission holding its meeting at St Andrews.

Reports submitted from the coordinators of the commission's working groups were discussed. These covered the 1987/88 studies of methods for the determination of:

- mineral oil residues
- colour of lecithins
- lead by AAS
- triglycerides by reversed-phase HPLC
- polymerized triglycerides by gel-permeation HPLC
- phospholipids by HPLC
- fatty acids by capillary GLC
- benzo- α -pyrene

The results for the determination of triglycerides by reversed-phase HPLC and lead in oils and fats by AAS were most satisfactory and the methods were adopted. Very good results were also obtained with the rapid method for benzo- α -pyrene but little progress had been made with the method for the determination of mineral oil residues.

New items of work to be considered by the commission are for the determination of:

- contaminants in oils shipped in bulk
- halogenated solvents in olive oils
- precision data for peroxide value and acidity value
- evidence of refining
- phosphorus in oils

It was also agreed to support the International Organization for Standardization (ISO) study of the proposed replacement of carbon tetrachloride by cyclohexane in the procedure for the determination of the iodine value, and to cooperate with the Food Chemistry Commission (VI.1) in a project for lipid oxidation assessment.

The commission has been complimented for its publication record by the president of the Applied Chemistry Division and was informed at the meeting that there was now a sufficient number of new methods developed by the working groups to allow publication of a supplement to the 7th edition of *Standard methods for the analysis of oils, fats and derivatives.*

During their stay in St Andrews the delegates had the pleasure of hearing an organ recital in St Salvator's College Chapel by IUPAC affiliate Dr Douglas Lloyd of St Andrews University. Several of the delegates accepted an invitation to attend the two-day symposium arranged by the International Union of Nutritional Sciences which was also held at the University. The meeting was followed by a most successful IUPAC sponsored Workshop on the

Analysis of Oils and Fats held in the chemistry department of the university. Thirty one people from nine countries took part.

W. Dennis Pocklington

Chemical actinometers project finalized

The Commission on Photochemistry (III.3) met from the 19th to 21st July 1988 during the 12th International Symposium on Photochemistry held in Bologna, Italy. Because of their attendance at the symposium, several associate members and national representatives - in addition to titular members - were able to attend the commission meeting.

The July 1988 issue of *PAC* contained plenary lectures presented at the symposium and also two documents prepared by the commission. The latter were the "Glossary of terms used in photochemistry" and "Reference materials for fluorescent measurements".

The list of chemical actinometers, organized by phase and wavelength, and including procedures for their use, has been finalized. After minor corrections the document will be submitted to the Organic Chemistry Division for its approval and subsequent publication.

A list of about 30 experiments on photochemistry to be used at various levels of teaching was discussed again. It will be edited and published. The draft on "Recommendations for the evaluation of fluorescence decay analysis" was discussed and a new draft will be circulated among a list of experts. The projects on "Methods and standards for the evaluation of absorption coefficients of transient species in solution" and on "Electronic spectra of radical ions" were discussed. New drafts including the comments of several experts will be prepared for the meeting at the Lund General Assembly.

Silvia E. Braslavsky

Stability of biomacromolecules

One of the projects of the Steering Committee on Biophysical Chemistry is called "Stability of biomacromolecules". The coordinator of this project is Brigitte Heinritz (Institute für Biotechnologie, Akademie der Wissenschaften der DDR, Permoserstraße 15, Leipzig 7050).

The aim of the project is to support workers of applied sciences, such as biotechnology, in their research. It may also direct the attention of frontline workers of biosciences to important research objectives of biotechnology, such as biocatalysts of increased long term stability and hydrophobicity.

During meetings in Lund, Pushchino, and Moscow in 1987/8, the first outline of the project was prepared. This included:

- a publication on the practical importance of protein stability in biotechnology
- a data compilation.

The data compilation will be composed of several parts such as:

- thermodynamic data on stability of biomacromolecules (specific heat capacity, enthalpy and Gibbs energy of unfolding of biomacromolecules),
  inactivation kinetics,
- stability related biochemical data.

A scheme for a computer-aided data compilation on stability of biomacromolecules has been prepared and this has been sent to research groups in several countries.

Brigitte Heinritz

Agrochemical Commission meets in China

Since the general assembly in Boston, the Agrochemical Commission (VI.5) has published major projects on "pesticides in ground water"; "evaluating the environmental behaviour of pesticides" and "pesticide metabolism - extrapolation from animals to man". The last publication is particularly notable since it was the first monograph published by the commission and is available by purchase from Blackwell Scientific Publications (see September 1988 issue of *CI*, pages 192-194).

At the commission meeting held in Tianjin, China, 21-24 August 1988, efforts were concentrated on two projects nearing completion. Bearing in mind the importance of environmental fate of pesticides, a project on "Microbial conversion of pesticides" has been in preparation for two years and a final draft was produced. The project covers not only environmental aspects but also pesticide performance since

Agrochemicals Commission Secretary Dr Terry R. Roberts. At the commission meeting in China, efforts were concentrated on two projects nearing completion: (1) microbial conversion of pesticides, and (2) significance of impurities in pesticides.

unwanted enhanced degradation of some chemicals has been observed after repeated applications.

The project on "Significance of impurities in pesticides" is also nearing completion. A new project was initiated on the relevance of pesticide metabolites and a first draft will be available in 1989.

In addition to the work on projects, the preparations for the 7th International Congress on Pesticide Chemistry to be held in Hamburg, FRG in 1990 were debated. Planning is progressing well and, in particular, the format of worshop discussions were debated. The possibility of preparing summaries on issues of current public interest or concern on pesticides for issue at the congress was considered and some examples were drafted for discussion during the next year.

Finally, the commission meeting was followed by an IUPAC/China Pesticide Chemistry Workshop and the preparations for this were completed at the meeting. A report of the workshop will appear in a forthcoming issue of *CI*.

Terry R. Roberts

Solubility data

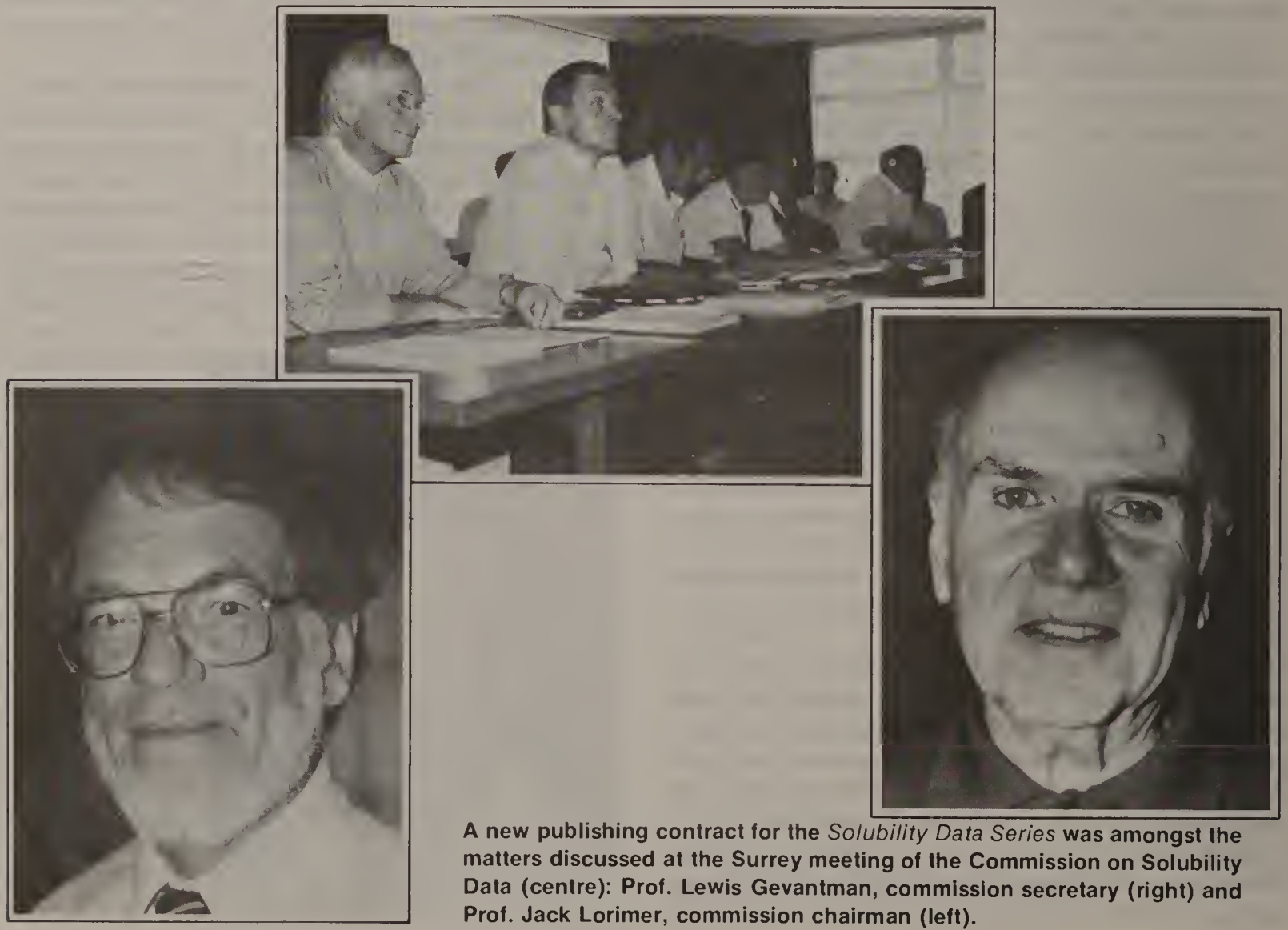
When the Commission on Solubility Data (V.8) met at the University of Surrey, UK on 21-22 August 1988, it paid tribute to the memory of Prof. A. S. Kertes, past chairman of the commission and editor-in-chief of the *Solubility Data Series*.

The commission, acting on behalf of IUPAC, entered into the final stages of concluding a publication contract with Pergamon Press for the series. The new contract will extend until 1992. Based on past experience, changes have been made in the contractual arrangements which should result in the smooth handling of manuscripts and all of the promotional and financial activities relating thereto.

The commission was able to clear a back-log of manuscripts waiting to be published and four of these newly published documents were displayed at the 3rd International Symposium on Solubility Phenomena. This symposium was organized by members of the commission and held at Surrey immediately after the commission meeting. It was attended by 120 scientists from all over the world and dealt with a wide variety of topics ranging from pollutant solubility to the solution thermodynamics of polymers, gases, electrolytes. (*Ed:* A brief report on the meeting will appear in a forthcoming issue of *CI*.)

The commission reviewed its accomplishments to date and established new goals consistent with IUPAC and Analytical Chemistry Division guidelines which would help focus its operation in future. Their goals dealt with database automation and new topics for the *Solubility Data Series*.

Lewis Gevantman



A new publishing contract for the *Solubility Data Series* was amongst the matters discussed at the Surrey meeting of the Commission on Solubility Data (centre): Prof. Lewis Gevantman, commission secretary (right) and Prof. Jack Lorimer, commission chairman (left).

Teaching materials in frontier areas

When the Committee on Teaching of Chemistry (CTC) met in Lisbon, Portugal, 29-30 August 1988, it considered the proposed collaboration with IUPAC divisions for the preparation of teaching materials in frontier areas. A pilot project has started in association with the Commission on High Temperature and Solid State Chemistry (II.3). Prof. Tretyakov informed the committee that the first draft would be ready soon for comments by specialists and teachers.

A workshop for producing instructional material on energy and the environment will be held in Berkeley, USA, in 1989. This will be a joint effort between CTC, UNESCO and the teaching commission of the International Union of Biological Sciences (IUBS).

The 10th International Conference on Chemical Education (ICCE) will be held in Waterloo, Canada from 20th to 25th August, 1989. The theme of the conference will be "Excellence in chemistry". About 1000 delegates from all over the world are expected to participate.

CTC has decided to associate with the Chemistry Olympiads. To start with, CTC will provide safety guidelines, offer expertise in the formulation of preparatory texts and hold at the 10th ICCE a round table discussion with the organizers of the olympiads.

The Low Cost Equipment Project held workshops in Afghanistan (October 1987), Philippines (May 1988), Federal Republic of Germany (July 1988) and Malaysia (August 1988. It also held four teacher training workshops in India where 40 institutions are now using equipment from the project. A production centre is being established at Delhi University. This will supply about 1000 pieces of low-cost equipment to student laboratories in 1988.

Volume II entitled "Instrumentation for colorimetry with illustrative experiments" of the series *Locally produced equipment and experiments for chemistry teaching* has been published in collaboration with UNESCO. A database of experts in chemical education is in preparation. A sample of nearly 200 entries is ready. The *International Newsletter on Chemical Education* was published at the end of 1988. It was devoted to the topic of "Safety in Schools".

Krishna Sané

Publication guidelines for organic chemistry

A working party of the Commission on Physical Organic Chemistry (III.2) has developed guidelines for publication in response to the growing disparity in the publications of research in experimental organic chemistry. The working party is chaired by Prof. W. Drenth. The guidelines are intended to help unify journal reports for procedures, the characterization of compounds, derived quantities and mechanistic interpretations.

A parallel effort to establish guidelines for the presentation of quantum mechanical computational data in organic chemistry, guided by Profs E. A. Halevi and T. Albright, has resulted in a document that establishes what information should be reported in the primary chemical literature relating to the techniques and results of quantum mechanical calculations.

Both guidelines were approved by the Commission on Physical Organic Chemistry when it met in

Profs. Maurice Chastrette (chairman) and on the right Aleksandra Kornhauser (member) of the Committee on Teaching of Chemistry which met in Lisbon, Portugal, August 1988.

Regensberg, FRG, 26-28 August 1988. The guidelines are currently undergoing external review.

Previous efforts of the commission that recently resulted in the publication of "Naming of hydrogen" (*PAC*, Vol. 60, No. 7, pp. 1115-1116, 1988) and in the chemical transformations" and thelature fororgani "Symbolization of reaction mechanisms" were the culmination of a 10-year involvement intended to offer consistency in communication of hydrogen in all of its chemical forms, as well as to provide useful alternatives to "name" reactions and currently inadequate symbolization for organic reaction mechanisms.

New efforts of the commission, under the chairmanship of Prof. Paul Müller, have been directed to the development of uniform terminology for the broadening discipline of organic chemistry. The establishment of class names of reaction intermediates is well underway.

Joint working parties with the Commission on Nomenclature of Organic Chemistry are involved with class names of organic compounds based on structure and with stereochemical terminology. A feasibility study for terminology in organometallic chemistry was recommended, and a working party on structure-activity parameters and relationships has been formed.

The commission has also decided to produce a second edition of the "Glossary of terms used in physical organic chemistry" which was begun by the late Prof. Victor Gold in 1976 and published provisionally nearly 10 years ago.

At the commission meeting, consideration was given to publicity for projects undertaken by the commission. General agreement was reached that once projects are published in *PAC*, shortened versions should be published in appropriate national disciplinary journals to acheive optimum visibility and impact.

The Regensburg commission meeting was the fourteenth of a series of commission meetings. It was held in conjunction with the 9th International Conference on Physical Organic Chemistry. The 10th Conference will be held in 1990 in Haifa, Israel.

Michael P. Doyle

Publications

Chemistry of oxide superconductors

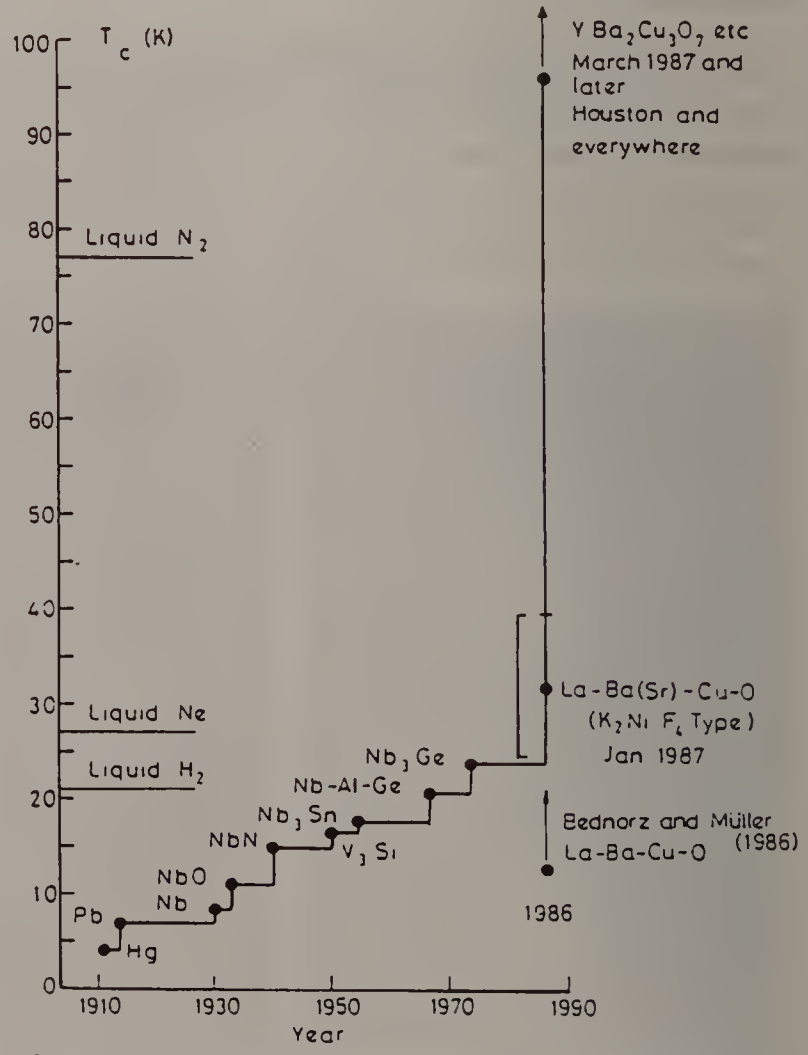
Chemistry of oxide superconductors, edited by Prof. C. N. R. Rao, is intended to highlight the chemical aspects of oxide superconductors and show how solid state chemistry (structure, bonding and stoichiometry) plays a crucial role in the superconductivity of these high-temperatures oxide superconductors.

The book was suggested by Prof. K. I. Zamaraev, President of the Physical Chemistry Division of IUPAC. He thought it would be most worthwhile to bring out a publication to highlight some of the "chemical" contributions to high-temperature super conductivity. This volume is the result of such an effort.

Although superconductivity was discovered as early as 1911, the highest transition temperature achieved before 1987 was around 23 K. It appeared as though 23 K was the upper limit for the superconducting transition temperature.

The situation changed suddenly, however. Oxides of the La-Ba(Sr)-Cu-O system possessing the K_2NiF_4 structure were found to show superconductivity in the 30-40 K region early in 1987. Soon after, $YBa_2Cu_3O_7$ oxides possessing the defect perovskite structure as well as other rare earth cuprate derivatives with a similar formula were found to exhibit superconducting transitions at 95 ± 5 K, well above the liquid nitrogen temperature.

Several other oxides showing high-temperature



Increase in the superconducting transition temperature with time since the discovery of superconductivity (modified from the figure of Muller and Bednorz. *Science*. Sept. 1987).

The discovery of high-temperature oxide superconductors has created a great sensation, comparable only to that of the transistor, because of the immense technological potential of these materials in building magnets, and in electronics, power and other sectors. IUPAC Past-President, Prof. C. N. R. Rao, who edited *Chemistry of oxide superconductors*. Prof. Rao is Director, Solid State and Structural Chemistry Unit, Indian Institute of Science, Bangalore.

superconductivity have since been identified and there are indications that we may reach even higher transition temperatures in the near future. The progressive increase in superconducting transition with time over the last four decades is shown in Fig. 1 to highlight the big jump in 1987. The discovery of high-temperature oxide superconductors has created a great sensation, comparable only to that of the transistor, because of the immense technology potential of these materials in building magnets, in electronics, power and other sectors.

All the high-temperature oxide superconductors are complex chemical systems. Metal oxides have constituted a vital area of research in solid state chemistry for many years and knowledge gained by these investigations has been of great value to the study of the new superconductors. Many chemists have been working on the synthesis, structure, properties, theory and other important aspects of the oxide superconductors. The new superconductors have given a big boost to research in solid state chemistry.

Outline of contents: Chemistry of high-temperature oxide superconductors; The role of chemistry for generation of high-T_c oxide superconductors; $Ba(Pb, Bi)O_3$ superconductors and their relationship to the copper based superconductors; Chemistry and high-T_c superconductivity in the La-Ba-Cu-O system; Synthesis, structural chemistry and properties of YBa_2-Cu_3O_{7-x}; High-T_c superconductivity in $LnBa_2Cu_3O_7$ (Ln = La - Yb, Y) compounds; Chemistry-T_c relations in oxide superconductors; Kinetics of oxygen uptake in $YBa_2Cu_3O_x$; The role of oxygen in $YBa_2Cu_3O_{7-}$; Isoelectronic analogs of the high temperature oxide superconductors; Theory of superconductivity in systems with strong coulomb correlations, with applications to the organic and oxide superconductors; Raman scattering studies of the copper-oxygen vibrations and oxygen order in La, Y-Ba, Sr-Cu oxides; A simple method to prepare high-T_c superconducting thin films: pulsed laser deposition.

Chemistry of oxide superconductors *is edited by C. N. Rao and published by Blackwell Scientific Publications Ltd, Oxford, UK, 1988. viii + 199 pp. ISBN 0-632-02302-3. Price GBP 22.50/USD 31.00. Affiliate members Discount Price GBP 16.50/USD 23.00*

Environmental consequences of nuclear war

The June 1988 issue (Vol. 30, No. 5) of *Environment* is largely devoted to the environmental consequences of nuclear war: a new scientific consensus from SCOPE and the United Nations. SCOPE is the Scientific Committee on Problems of the Environment - a committee of the International Council of Scientific Unions (ICSU).

In March this year, at a workshop in Moscow, SCOPE formally ended its study on the environ-

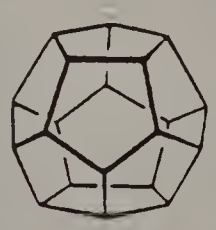
Sir Frederick Warner chaired the SCOPE ENUWAR project from its beginning in 1983. In his report, published in *Environment*, he states, "The overall results of ecological effects studies. . . are largely unchanged from the initial results reported in the second volume of SCOPE 28. That is, the climatic and economic-societal consequences of a major nuclear war could put a majority of the world's population at risk of starvation."

mental consequences of nuclear war (ENUWAR). The SCOPE ENUWAR study (see pages 56-58, March 1987 issue of *CI*) began in November 1983 with a workshop in Stockholm and continued in New Delhi, Leningrad, Tallinn, Delft, Paris, Hiroshi-ma, Essex, Toronto, Caracas, Melbourne, London, and Essex before bringing a draft report to Washington DC in July 1985. This was published in two volumes as SCOPE 28 in 1986 along with a shorter version written for a general audience (see pages 25-26, December 1986 issue of *CI*).

Since then, additional workshops have been held in London, Bangkok, Geneva and Moscow. The reports in the June issue of *Environment* summarize much of the thinking up until the time of the Moscow meeting:

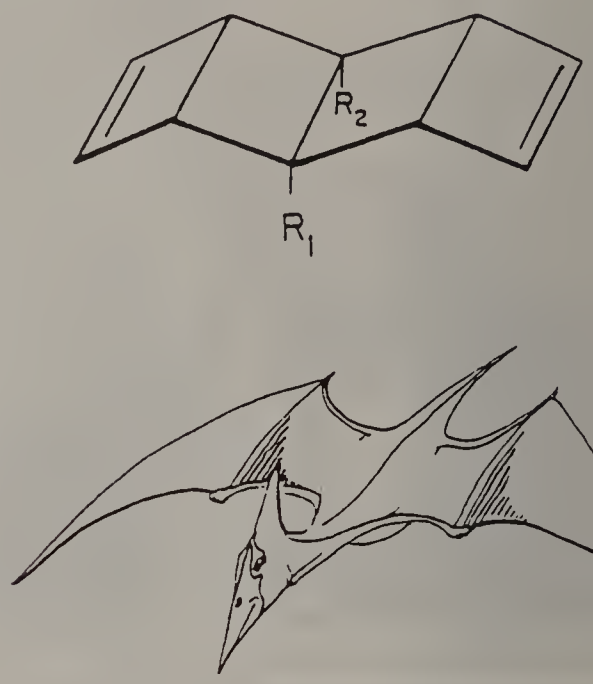
- The environmental effects of nuclear war: consensus and uncertainties (Sir Frederick Warner)
- Global effects of nuclear war: a status report (R. P. Turco and G. S. Golitsyn)
- Modelling the dispersal and deposition of radionuclides: lessons from Chernobyl (H. M. ApSimon, P. Gudiksen, L. Khitrov, H. Rodhe, and T. Yoshikawa)
- The biological consequences of nuclear war: initiating national case studies (Mark A. Harwell and Ann C. Freeman)
- New Zealand after nuclear war (Wren Green)
- Scaling global climate projections to local biological assessments (Thomas P. Ackerman and Wendell P. Cropper, Jr)
- Health effects of nuclear war: new perspectives (Alexander Leaf and Takeshi Ohkita)
- Radiological effects of nuclear war: (Charles S. Shapiro)
- The climatic and other global effects of nuclear war (United Nations Study Group).

Pterodactyladienes, other euonyms and the death of Monsieur Litre



The systematic name for the above structure is: undecacyclo[9.9.0.$0^{2,9}$.$0^{3,7}$.$0^{4,20}$.$0^{5,18}$.$0^{6,16}$.$0^{8,15}$.$0^{10,14}$.$0^{12,19}$.$0^{13,17}$]-eicosane, however, most chemists would probably prefer to use its euonym "dodecahedrane" since it is not only easier to say but also more informative.

A euonym is a name well suited to the person, place, or thing that it names. Another example of a euonym is the name of the following group of compounds which their creator, Rowland Pettit of the University of Texas as Austin, dubbed "pterodactyladienes". These structures reminded him of the extinct flying reptiles known as pterodactyli. This is a Latin word which stems from the Greek *pteron* (wing) and *daktylos* (finger).



These and other examples are found in *Organic Chemistry: The Name Game, Modern Coined Terms and Their Origins* edited by IUPAC affiliate Alex Nickon (The Johns Hopkins University) and Ernest F. Silversmith (Morgan State University). The book deals with the origins of contemporary terms in organic chemistry.

Whilst delving into original publications for names, who coined them and in what context, the authors contacted hundreds of chemists world-wide - an undertaking that extended over 10 years. Although the book's main focus is terminology, it also includes over 500 drawings and numerous human interest items that do not appear in the literature.

The contents include chapters with titles such as: An animal is a chemist's best friend; Chemistry is no flask in the pan; Elements, my dear Watson; and Molecules have home towns, too!

And now for another piece of information (from Appendix A - Brief etymology of some tráditional chemical names): The name "benzene" derives from *Styrax benzoin*, a tree native to Sumatra and Java. The bark yields a resin, gum benzoin, from which "benzoic acid" was obtained. Péligot (1833) and E. Mitscherlich (1834) heated benzoic acid with lime to form C_6H_6; Mitscherlich named it "benzine. . ." Liebig preferred "benzol", but Laurent (1835) proposed "benzene" - which all goes to show the truly international nature of chemistry and its nomenclature.

It was therefore pleasing although somewhat embarrassing for the current editor of *Chemistry International* (author of this review) to find (on page 77) a reference to IUPAC and *CI:*

IUPAC affiliate Alex Nickon (left) and Ernest Silversmith, co-authors of *Organic Chemistry: The Name Game, Modern Coined Terms and Their Origins.*

"Once in a while, something written with tongue-in-cheek seems credible and is accepted at face value. Such was the case of a three-page biography of Claud Emile Jean-Baptiste Litre, composed by physicist K. A. Woolner and published in an April issue of *Chem 13 News* (No. 95, pp. 1-3, 1979). This engaging article commemorated the 200th annviersary of the death of Monsieur Litre (1716-78), maker of scientific glassware and namesake for the SI unit of volume. Not recognised as a jest, the biography was condensed and featured in *Chemistry International,* the official news magazine of IUPAC (*CI,* No. 1, p. 32, 1980). Prof. M. L. McGlashan (University College, London) revealed the hoax to the magazine's editor (Marty Gellender), who dutifully relayed the exposé to its readers (*CI,* No. 3, p. 2, 1980)."

Organic Chemistry: The Name Game *was published by Pergamon Press, Oxford, UK, 1987. xii+ 347 pp. ISBN 0 08 034481 X/0 08 035157 3 (hardcover/flexicover). Price USD 75.00/USD 29.50*

Chemistry and life

Top: Staff of the popular Soviet science monthly journal *Chemistry and life.* Bottom left: Mr Gennadi Maltzev (left) welcomes *Chemistry International* Editor, Dr Mike Freemantle. Bottom right: Dr Valentin Roubailo, Finance Committee member who also visited the journal's editorial offices.

Chemistry and life is a popular science monthly journal of the USSR Academy of Science. In May, the National Committee of Soviet Chemists arranged for Dr Mike Freemantle, Editor of *Chemistry International* and IUPAC Finance Committee member, Dr Valentine Roubailo to visit the editorial offices of the Soviet journal.

The visit took place during the IUPAC Executive Committee meeting in Moscow. During the visit, Drs Freemantle and Roubailo met staff of the journal and had discussions with Assistant Editor, Mr Gennadi Maltzev.

Mr Maltzev explained that the journal was founded in 1965 and now has a circulation of 295 000. He went on to say that the journal is intended for specialists and lay people who wish to keep track of the latest trends and achievements in chemistry, physics, biology and medicine. It is also read by people in industry and agriculture.

Chemistry and life includes articles which focus on the urgent problems of perestroika (restructuring) in science, industry and agriculture, new technologies and environmentally safe methods of production. The journal also publishes science fiction by Soviet and foreign authors.

For further information on Chemistry and Life *contact: Editorial Office, 117045 Moscow, Maronovsky per., 26. Tel.* +7 (095) 238-23-56.

Chemistry dictionary

The *Macmillan Dictionery of Chemistry* is a dictionary of chemical terms and concepts intended as a reference volume for scientists of all displines, whether student or professionsal, and particularly for those involved in industry or who may come across chemical terms in the course of their work. It covers all branches of chemistry.

Extensive use is made of general entries in which characteristics of related compounds are described, often in tables or reaction schemes. SI units and IUPAC recommendations for systematic nomenclature of inorganic and organic compounds are used throughout together with cross-referenced trivial and other names. The book has over 5 200 entries and is illustrated.

The Macmillan Dictionary of Chemistry *by D. B. Hibbert and A. M. James is published by The Macmillan Press Ltd, Basingstoke, UK, 1987. viii + 532 pp. ISBN 0-333-43471-4. Price GBP 14.95.*

PAC Review

Pure and Applied Chemistry (*PAC*) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Photochemistry

The 12th IUPAC Symposium on Photochemistry was held in Bologna, Italy from 17 to 22 July 1988. At the symposium, Prof. Heinz Roth AT&T Bell Laboratories, USA) delivered an invited lecture on "Magnetic resonance methods in the mechanistic photochemistry of ketones, olefins and oximes" in honour of the historic work of Giacomo Ciamician who was one of the founding fathers of photochemistry. Roth's lecture, along with other plenary and invited lectures, was published in the July 1988 issue of *PAC*.

In his lecture, Roth said that modern molecular photochemistry offers a seemingly limitless variety of reactions. Nevertheless, the number of primary reaction types is strictly limited. In the broadest sense, primary photochemical reactions are divided into four general reaction types: two each of unimolecular and bimolecular nature.

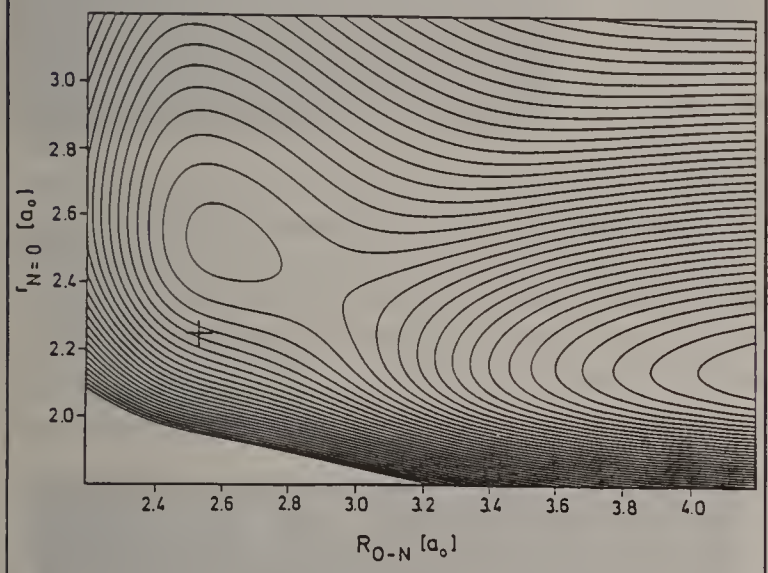
The unimolecular reactions include rearrangements and fragmentation or cleavage reactions, whereas the bimolecular category is comprised of cyclo-additions and abstraction or transfer reactions. Many abstractions and fragmentations have been shown to proceed via radical pair, biradical, or carbene intermediates. In contrast, the intermediates involved in rearrangements and cyclo-additions have been more elusive, leading to speculation that these reactions may be concerted.

Roth pointed out that the pioneering work of Giacomo Ciamician and his associate Paul Silber in Bologna between 1900 and 1915 provided an early indication of the rich variety of photochemical reactions. Interestingly, their substrates were chosen so that their work covered the full range of the general reaction types mentioned above. Indeed, many of the specific reactions investigated by the Bologna group have remained at the focus of much attention, although the emphasis of the investigations has changed.

Current interest is centred on mechanistic questions, particularly on the nature of the potential intermediates, whereas Ciamician and Silber were interested mainly in exploring the wide range of reactions that could be induced by exposure of organic compounds to sunlight.

Roth then demonstrated that magnetic resonances methods are well suited to probe the intermediacy of radicals or radical ions, radical (ion) pairs, biradicals, or carbenes, and have shed new light on many of the reactions explored by Ciamician and Silber. He chose representative reaction types studied by the bologna group and elaborated current research, particularly the application of magnetic resonance techniques, in these areas.

Photodissociation of molecules: the microscopic path of a molecular decay



Contour plot of the ab initio S_1–potential surface of CH_3ONO. The energy spacing is 0.136 eV. The cross indicates the equilibrium of S_0 (Frank-Condon region).

At the Bologna Symposium on Photochemistry, J. Robert Huber (University of Zurich, Switzerland) presented a plenary lecture on the photodissociation of molecules: the microscopic path of molecular decay. In the lecture, he reviewed the state-selective photodissociation of methylnitrite:

$$CH_3ONO(S_0,v) + h\mu \longrightarrow CH_3O\cdot + NO(t,r,v)$$

Huber also analysed the dynamics of the bond breaking process in connection with an *ab initio* S_1-potential energy surface of the parent molecule. Experimental and theoretical results revealed an interesting picture of the dissociation path of a polyatomic molecule which decays by vibrational predissociation and a strong exit channel interaction.

Vectorial phototransfer of electrons across lipid membranes

A paper at the Bologna symposium by Prof. Kiril Zamaraev and co-workers at the Institute of Catalysis, Novosibirsk, USSR was concerned with

Physical Chemistry Division President Prof. Kiril Zamaraev at the Institute of Catalysis, Novosibirsk, USSR.

vectorial phototransfer of electrons across lipid membranes. In the paper, Zamaraev described studies, in two systems, of the kinetics and mechanisms of the transmembrane vectorial electron phototransfer from donors located in the inner cavities of lecithin lipid vesicles to acceptors located outside the vesicles.

The EDTA-ZnTPP-Methylviologen system contains tetraphenylporphyrinatozinc embedded into vesicular membrane. ZnTPP serves both as a photosensitizer and as a carrier of electrons from EDTA to methylviologen.

The $Ru(bipy)_3^{2+}$-Cetylviologen-$Fe(CN)_6^{3-}$ system contains an electron carries -cetylviologen, embedded into the membrane. Under light, the viologen transfers electrons from the photosensitizer - $Ru(bipy)_3^{2+}$ located in the inner cavity of the vesicle through the membrane to $Fe(CN)_6^{3-}$ in the bulk volume.

Zamaraev discussed the possibilities of using photochemical systems based on lipid vesicles for accomplishing water cleavage.

Coordination chemistry

In recent years the chemistry of rare earths has become a fruitful and exciting field of study. The successful syntheses of numerous novel rare earth compounds and their peculiar optical, magnetic, superconducting and catalytic properties has not only attracted the interest of experimental chemists but also provided a great theoretical challenge.

Prof. Guang-Xian Xu (Peking University) whose lecture on "Coordination chemistry of rare earths: syntheses, structure, spectroscopy and chemical bonding" was published in the August 1988 issue of *Pure and Applied Chemistry*.

The partially filled 4*f*-subshell of lanthanide compounds exhibits special optical and magnetic behaviour. The theoretical analysis of these phenomena is usually undertaken in terms of the ligand field theory. However, for the study of chemical behaviour, such as the catalytic activities, and the long-standing controversy over the nature of chemical bonding of 4*f*-organometallics, and also for the prediction of new lanthanide compounds, it is more appropriate to use the molecular orbital theory.

In order to apply molecular orbital theory for the calculation of the electronic structure of lanthanide compounds, Guang-Xian Xu and his co-workers at Peking University, Beijing, have extended the INDO formalism to 4*f* orbitals, derived all the expressions needed for the SCF MO calculations involving 4*f* atomic orbitals and evaluated VOIP, Slater and Racah parameters from the most recent spectral data.

In a plenary lecture on "Coordination chemistry of rare earths: syntheses, structure, spectroscopy and chemical bonding" presented at the 25th International Conference on Coordination Chemistry held in Nanjing, China, 26-31 July 1987, Xu discussed systematically the molecular and electronic structure of mononuclear, dinuclear, polynuclear complexes and clusters of rare earths. He described an extended INDO method applied to 4*f*-compounds, with respect to the nature of chemical bonding and factors influencing the coordination number and structure types of lanthanide complexes and organometallics.

He also discussed some recent investigations at Peking University on the synthesis, molecular and electronic structure of some novel peroxy-bridging tetranuclear lanthanide complexes.

Overlooked opportunities in stereochemistry

One of the intriguing but unanswered questions in the history of coordination chemistry is why it took so long for Alfred Werner (1866-1919) and his students to resolve coordination compounds and thus prove the correctness of both his concept of the octahedral configuration for cobalt(III) and his coordination theory.

In view of Werner's expertise in both organic and inorganic stereochemistry, especially of nitrogen compounds, and his documented familiarity with the work of Sir William Jackson Pope, it is surprising that he did not immediately avail himself of the new and versatile resolving agents introduced by that famous English stereochemist. Similarly, it is surprising that Pope did not make use of Werner's theoretical views to interpret the configurations of the unusual compounds which he had synthesized and resolved for the first.

Prof. Kazuo Saito, Inorganic Chemistry Division President, 1985-87, gave a plenary lecture on "Characteristics of electron transfer reactions of early transition elements" at the Beijing conference. In his lecture he described structural and kinetic studies of electron transfer in oxovanadium(IV) and dioxovanadium(V) complexes. He then considered the electrochemistry of bi- and ternuclear molybdenum and tungsten species and their mixed metal complexes with bridging oxide. Finally, he reviewed work on the crystal structure and redox potential of octahedral hexanuclear molybdenum complexes of mixed capping ligands with halide and chalcogenide.

Sir William Jackson Pope (1870 - 1939) was IUPAC president from 1923 to 1925. Pope made numerous contributions to the resolution of optically active isomers. In 1893, together with Frederick Stanley Kipping, he found that camphor can be sulfonated by fuming sulfuric acid and that the sulfochlorides, sulfobromides, and their derivatives were compounds of exceptional crystallizing power.

Until 1899, compounds that exhibited optical activity all contained one or more asymmetric carbon atoms, and it was widely believed that the presence of an asymmetric carbon atom was a necessary condition for optical activity. In 1899, Pope and Peachy succeeded in using silver (+)-3-bromocamphor-9-sulfonate to resolve methylallylbenzylammonium iodide. This resolution furnished evidence for Werner's postulated tetrahedral configuration for nitrogen and showed, for the first time, that the carbon atom had no monopoly on optical activity.

In a lecture on "Overlooked opportunities in stereochemistry: neglected connection between Werner's metal-ammines and Pope's organic onium compounds" George B. Kauffman (California State University, USA) examined the contributions of both chemists to the field of stereochemistry and discussed possible reasons why they failed to use each other's work to solve their respective stereochemical problems.

Plenary and invited lectures, including those of Xu, Saito and Kauffman, presented at the Nanjing conference on Coordination Chemistry were published in the August 1988 issue of *PAC*.

Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

Determination of traces of thallium in various matrices

Thallium is a relatively rare element with a limited application. Nevertheless its analytical chemistry is of importance because of the high toxicity of the element (e.g. maximum allowable concentration in air : 0.1 mg m^{-3}). The toxicity depends in practice on the speciation of the element; three categories of Tl-compounds should be considered: Tl(I), Tl(III) and organohalide compounds. The normal contents of total Tl are mostly below 10 ng g^{-1}. Therefore sampling, sample treatment, concentration and determination form all paramount steps in an analytical procedure.

This report deals with a critical discussion and recommendations with regard to digestion procedures, concentration methods as well as to method of final determination. Existing literature is extensively reviewed and discussed.

Some conclusions are:

1. flame atomic absorption spectrometry is a versatile technique for (digest) solutions down to approximately 1 μg ml^{-1};
2. optimal detection power is achieved by inductively coupled plasma-mass spectrometry. A table presents optimal combinations of pretreatment, separation/concentration and final determination techniques for various types of water, acids, metals, salts, minerals, rocks, ores and biotic materials.

This report was prepared for publication by B. Griepink, M. Sager and G. Tölg, Commission on Microchemical Techniques and Trace Analysis (VI.2), Analytical Chemistry Division, and published in PAC, *Vol. 60, No. 9, pp. 1425-1436, 1988.*

Interpretation of speciation measurements: a case study. Direct polarographic determination of O_2, Fe(II), Mn(II), S(-II) and related species in anoxic waters

Direct polarographic measurements of naturally anoxic waters can readily determine Fe(II), Mn(II), S(-II) and dissolved O_2. Procedures for collecting and handling samples are described and the results

from different studies are systematically discussed and evaluated.

The unique capabilities of polarography to distinguised bewteen soluble, colloidal and particulate species have led to the characterization of the time-dependent formation of colloidal, complexed and solid phase forms of FeS in natural waters, and to an appreciation of the complicated dsitribution of various oxidation states of Mn and Fe between particulate and collloidal fractions.

This report was prepared for publication by William Davison, Jacques Buffle and Richard DeVitre, Sub-committee on Environmental Analytical Chemistry, Analytical Chemistry Division, and published in PAC, *Vol. 60, No. 10, pp. 1535-1548.*

The Stockholm Congress

IUPAC STOCKHOLM 1989

The 32nd IUPAC Congress, organised by the Swedish National Committee for Chemistry of The Royal Swedish Academy of Sciences will take place in Stockholm, Sweden from Wednesday 2nd to Monday 7th August.

The 32nd IUPAC Congress will take place at the Stockholm International Congress Centre from Wednesday 2nd August to Monday 7th August.

The scientific programme (see below) will consist of seven sections. With the exception of the plenary lectures these will take place concurrently. Each section will consist of a plenary lecture, invited lectures, oral contributions and posters. In addition, a plenary lecture on chemical education will be given by Prof. G. C. Pimentel (University of California, USA).

The official language of the congress is English. No translation facilities will be available.

The registration fees are SEK 1800 for active participants, SEK 800 for students, SEK 750 for accompanying persons. The fee for IUPAC affiliates will be reduced by 10%. Accommodation ranging from rooms in students' residences to luxury class hotels have been reserved for participants. A social programme including two receptions, a concert and a banquet is planned.

Stockholm City Hall where a reception and concert will be held for congress participants.

Scientific programme

The scientific programme will consist of seven sections:

1. *Large-scale separation of biological macromolecules, cells and particles*

Biochemical separation technology has become one of the key factors in the development of protein drugs by animal cell culturing or by fermentation of recombinant DNA micro-organisms.

The aim of this section is to provide the participants with a variety of key-note lectures by individual speakers, as well as oral presentations and posters which give a state-of-the-art account of technologies and applications for large-scale isolation and purification of bio-logical macromolecules such as peptides and proteins.

The plenary lecturer for this session will be Prof. M-R. Kula (Institut für Enzymtechnologies der Universität Düsselford in der KFA Jülich). The section will consist of subsections on the following five topics: preliminary recovery pro-cedures; purification; integration of fermenta-tion and purification; purification strategies and process design; modelling, automation and control of separation processes.

2. *Atmospheric and marine chemistry*

The concern over man's impact on the environment is to a large extent connected with the chemical industry and the use of its products.

Anthropogenic inputs have to be considered in relation to large natural fluxes of elements and compounds. The research related to these inputs has led to the detection and quantification of important natural processes and chemical reactions. In many

Stockholm is the capital and largest city of Sweden. It lies on the country's Baltic Sea coast approximately 725 km (450 miles) west of Leningrad. It is situated astride a navigable waterway between Lake Mälaren and the sea. The Stockholm archipelago consists of 24 000 islands although the city itself occupies only 14 of these islands and several peninsulas.

Stockholm is known as "Venice of the North". Norrmalm, the financial centre of modern Stockholm is north of the waterway with Södermalm, another business district, on the south side. The oldest part of the city lies on three islands between the two.

Sweden is the largest of the five Nordic countries and forms part of Scandinavia in northwestern Europe. It has a population of over about 8 500 000. The country is rich in iron ores and forest resources.

Stockholm has a continental humid climate. Participants at the congress can expect the temperature in Stockholm in August to be between 12° C and 18° C and rain is possible.

cases, for example for dimethyl sulphide, atmospheric reactions seem to balance the inputs from the ocean. In other cases, such as carbon dioxide, there is an anthropogenic build-up.

The concern for the environment and the need to develop meaningful waste treatment processes call for fundamental research in atmospheric and marine chemistry as well as extensive meteorological and oceanographic investigations.

The section will focus on chemical research, but with the aid of a special grant from the Salèn Foundation, an evening session will consider large-scale environmental aspects and discuss consequences of today's chemical industry. An excursion is planned to the Stockholm archipelago. There will be an exchange of opinion between the

IUPAC Congresses

32nd	Stockholm (Sweden)	1989
31st	Sofia (Bulgaria)	1987
30th	Manchester (UK)	1985
29th	Cologne (FRG)	1983
28th	Vancouver (Canada)	1981
27th	Helsinki (Finland)	1979
26th	Tokyo (Japan)	1977
25th	Jerusalem (Isreal)	1975
24th	Hamburg (FRG)	1973
23rd	Boston (USA)	1971
22nd	Sydney (Australia)	1969
21st	Prague (Czechoslovakia)	1967
20th	Moscow (USSR)	1965
19th	London (UK)	1963
18th	Montreal (Canada)	1961
17th	Munich (FRG)	1959
16th	Paris (France)	1957
15th	Lisbon (Portugal)	1956
14th	Zürich (Switzerland)	1955
13th	Uppsala (Sweden)	1953
12th	New York (USA)	1951
11th	London (UK)	1947
10th	Rome (Italy)	1938
9th	Madrid (Spain)	1934

IUPAC formed in 1919. Before World War I, there was an International Association of Chemical Societies.

8th	Washington (USA)	1912
7th	London (UK)	1909
6th	Rome (Italy)	1906
5th	Berlin (Germany)	1903
4th	Paris (France)	1900
3rd	Vienna (Austria)	1898
2nd	Paris (France)	1896
1st	Brussels (Belgium)	1894

congress participants and leaders of the Swedish Environmental Protection Authorities and Industries.

The plenary lecture will be given by Prof. M. O. Andreae (Max-Planck-Institut für Chemie, Mainz). The section will consist of seven subsections: photochemical processes; atmospheric corrosion; atmospheric trace chemistry; marine organic chemistry; marine solution chemistry; marine interface chemistry; hydrothermal chemistry.

One of the lecture theatres at the Stockholm International Congress Centre.

3. *Chemical communications and chemical interaction between organisms*

The molecular origin of interactions in biological systems has become an important topic of interdisciplinary and collaborative research, in which chemistry plays an important role. Real understanding of the basic principles that govern chemical communications and chemical interaction between organisms on a molecular level will provide useful information for applications in forestry and agriculture as well as in biotechnology.

This section will cover chemical aspects on exocrine chemical signals from micro-organisms, plants, aquatic and soil organisms, insects as well as other invertebrates, and vegetables. The separation, isolation, identification, structural elucidation and synthesis of the biologically active compounds will be discussed as well as molecular aspects of the biological functions including structure-activity relationships and chemical aspects of reception (chemoreception). Chemical aspects of applications for the control of pest porgamisms will also be discussed.

The section will focus on pheromones and related chemical signals, for example, allelochemicals, with reference to insects, marine and other aquatic organisms, micro-organisms such as fungi, bacteria and nematodes. The plenary lecture will be presented by Prof. K. Nakanishi (Columbia University, New York). There will be three subsections:

Members of the 32nd IUPAC Congress Coordination Committee: (from left), Arne Magnéli, Chairman of the Swedish National Committee for Chemistry; Brigitta Eriksson and Ebba Wahlström, General Secretaries; Sture Forsén, President.

general chemical aspects; structure activity relationships and receptor chemistry; applications for pest control.

Immediately after the meeting on Monday 7th August, the International Society of Chemical Ecology (ISCE) will have its annual meeting in Göteborg, Sweden. IUPAC congress participants are invited to attend this meeting.

4. *Solid state chemistry - frontiers in the chemistry of inorganic materials*

Solid state science is the basis for a large part of modern technology. This section will cover some trends in solid state chemistry and will focus on the following five areas: new preparative routes to inorganic materials; low-dimensional solids; extended defects and grossly non-stoichiometric solids; the chemistry of new electronic, magnetic and superconducting materials; the chemistry of high-performance ceramics and superhard materials.

The plenary lecture will be given by Prof. J. G. Bednorz (IBM Zürich Research Laboratory, Rüschlikon) who, with K. A. Müller, won the 1987 Nobel Prize for Physics for showing the possibility of occurrence of high-temperature superconductivity in oxides of the La-Ba-Cu-O system.

5. *Structure and dynamics of macromolecules*

This section covers a number of different aspects of macromolecular chemistry. The five section topics are chosen so as to naturally interlink with one another. The topics are: dynamic aspects of protein structure; computational chemistry; protein engineering; interactions between macromolecules; folding.

The plenary lecturer will be Prof. J. Deisenhofer (H. Hughes Medical Institute, Dallas).

6. *Electron transfer reactions*

The theme of this section reflects the great current interests in electron transfer processes. Recent developments have emphasized the importance of these processes in organometallic and organic chemistry, both in the theoretical and practical sense, for example for methods aiming at the large-scale capture of solar energy. The vigorously expanding fields of photo-electron transfer chemistry and photoelectrochemistry attest to the massive research efforts inspired by the latter aspect.

An entirely different property based upon electron transfer, conductivity in the solid state, has been explored for organic solids with great success, resulting in the design of superconducting organic materials.

Congress address

For further information on the Stockholm Congress write to: 32nd IUPAC Congress, c/o Stockholm Convention Bureau, PO Box 6911, S-102 39 Stockholm, Sweden.

The field of organic electrochemistry has been a source of electron transfer mediated organic reactions for a long time, and holds great promise for developing new synthetic pathways based upon the simplest of all Umpolung principles: addition to or removal of an electron from a species.

While most electro-organic processes involve outer-sphere electron transfer steps, homogeneous organic electron transfer reactions often seem to populate the gray area between outer-sphere behaviour and classical polar reactivity. This dichotomy has created a fertile ground for mechanistic discussions in physical organic chemistry. A rapidly emerging approach in the understanding of the biological effects of certain organic compounds is based upon their electron transfer reactivity.

The plenary lecturer for this session is Prof. J. K. Kochi (University of Houston). The five subsections are: photoelectrochemistry; photochemistry and chemiluminescence; organic synthesis using electron transfer mediated steps; mechanisms of electron transfer reactions of organic and organometallic molecules; conducting and superconducting organic materials; electron transfer and toxicity.

7. *Chemistry and biochemistry of bile acids*

The relationship between bile acid metabolism and disease is receiving increased attention. Four areas have been selected to illustrate connections between basic and clinical research.

An analytical session covers advances in chromatography, nuclear magnetic resonance and mass spectrometry. Gallstone disease is a question of factors controllng the composition and physical chemistry of bile.

The control of enzymatic reactions in bile acid biosynthesis, the mechanisms of bile salt transport, the enterohepatic circulation and the transformations by intestinal microflora are of importance for cholesterol homeostasis and development of atherosclerosis. The fourth session deals with the lack of enzymes or reactions required for normal formation of bile acids from cholesterols.

The four subsections are: methods of analysis; physical chemistry; biosynthesis and metabolism; inborn and acquired defects in bile acid biosynthesis. The plenary lecture will be given by Prof. M. Carey (Havard Medical School).

Science, technology and industry in Stockholm

Stockholm is now Sweden's principal manufacturing city and the country's second port - after Göteborg. Various industries in Stockholm produce metal and machine products, cars and modern communications equipment as well as paper and wood products. The city is also a major food-processing centre and the most important wholesale and retailing centre in Sweden.

In the late middle ages Stockholm became an important port for the export of metals, timber and furs from Sweden. The city probably originated in the establishment as a defence outpost on one of the islands which now make up the old town. The city is now the country's main industrial centre.

The Royal Swedish Academy of Sciences

The Royal Swedish Academy of Sciences and its current President, Prof. Ingvar Lindqvist who is Chairman of the Scientific Committee of the 32nd IUPAC Congress. The academy celebrates its 250th anniversary in March this year.

How the Nobel Prizes are awarded

In accordance with the will of Alfred Nobel, the Nobel Prizes in Physics and Chemistry have been awarded by The Royal Swedish Academy of Sciences since its inception in 1901. Since 1968 the Prize in Economic Sciences in Memory of Alfred Nobel has also been awarded by the academy.

The selection of award winners occupies the Nobel Committees for physics, chemistry and economics for the entire year. Each committee consists of three, four or five persons.

No person may be considered eligible for an award unless nominated in writing by a person competent to make such nominations. Personal applications for an award are not considered. The Statutes of the Nobel Foundation state that the following are competent to submit proposals for the award of prizes:

- Swedish and foreign members of the Academy of Sciences;
- Members of the Nobel Committees for Physics and Chemistry;
- Scientists who have been awarded the Nobel Prize by the Academy of Sciences;
- Permanent and acting professors in the sciences of physics and chemistry at the universities and of technology of Sweden, Denmark, Finland, Iceland and Norway, and at the Caroline Institute;
- Holders of corresponding chairs in at least six universities or university colleges selected by the Academy of Sciences with a view to ensuring the appropriate distribution of the commission over the different countries and their seats of learning.

Prof. Arne Tiselius (Uppsala University, Sweden) who won the Nobel Prize for Chemistry in 1948 and was IUPAC President from 1951 to 1955.

- Other scientists from whom the Academy may see fit to invite proposals.

In the case of the chemistry prize, about 2000 scientists are invited to submit proposals for the award of prizes. Typically, about 400 replies are received nominating 250-300 condidates. The Nobel Committee for Chemistry consists of five members, and co-opted members. The committee meets on the last day of January to consider proposals. Credentials of candidates are examined by upto 25 experts - who submit reports to the committee.

Before the end of September, the Nobel Committee submits to the academy its opinion and proposal for the award of prizes. The final decision is made by the academy in October. The prize-giving ceremony takes place on 10th December, the anniversary of Nobel's death. In 1987 each prize was SEK 2.2 million.

The Royal Swedish Academy of Sciences is an independent, non-governmental organization. It has established six scientific institutes, operates international scientific exchange programmes and publishes seven international periodicals - *Chemica Scripta*, for example.

The academy has about 250 Swedish members. Election of new members ensures that there are always 134 members under 65 years of age. there are also 134 foreign members.

The work of the academy is largely carried out within 12 classes.- of which chemistry is one - and through special boards and committees. The academy represents Sweden in the International Council of Scientific Unions (ICSU). It also administers the Swedish National Committees which handle contracts with ICSU's International Scientific Unions. The Swedish National Committee for Chemistry is, for example, IUPAC's national adhering organization in Sweden.

The academy is funded by the Swedish government, research councils and foundations supporting scientific research. The academy administers a large number of funds in trust, the yields of which are distributed as research grants for various scientific activities. About SEK 4 million are awarded annually - apart from the Nobel (see Box) and Crafoord Prizes.

The Crafoord Foundation was established in 1980 to promote basic research in the fields of mathematics, astronomy, biosciences (particularly ecology), geosciences and polyarthritis. An international prize and research grants for Swedish scientists are awarded among the sciences mentioned. The prize in 1987 was close to SEK 1.7 million, while a comparable amount was awarded in grants.

The address of The Royal Swedish Academy of Sciences is Box 50005, S-104 05 Stockholm, Sweden.

The Swedish Chemical Society and the IUPAC Affiliate Membership Scheme in Sweden

Dr Gudrun Lennartson, Secretary of the Swedish Chemical Society.

The Arrhenius Laboratory and Prof. Peder Kierkegaard who is Chairman of the Organising Committee of the 32nd IUPAC Congress.

The Swedish Chemical Society has about 4900 members. Its president is Dr Nils E. Stjernström. The society has two divisions: analytical and education and publishes three journals: *Kemisk Tidskrift, Nordisk Cellulosa* and *Acta Chemical Scandinavica*.

The society is a member of the Federation of European Chemical Societies and of the Nordic Chemistry Board. It is also represented at the meeting of Presidents of Chemical Societies. Other international matters are handled by the Swedish National Committee for Chemistry of the Royal Swedish Academy of Sciences.

On behalf of the Swedish National Committee, the society operates the IUPAC Affiliate Membership Scheme in Sweden. Unfortunately the response to the scheme in Sweden has been limited. Only six Swedish chemists registered as affiliates in 1986 and in 1987 and 1988 the number has been 10.

For further information write to: Svenska Kemistsamfundet (The Swedish Chemical Society), Wallingatan 26 B, S-111 24 Stockholm, Sweden.

University of Stockholm

The oldest and largest university in Sweden is in Uppsala and dates from 1477. There are five other universities: in Lund (venue of the 35th IUPAC General Assembly), Stockholm, Göteberg, Umeå and Linköping.

The University of Stockholm was given its name in 1960 when the College of Stockholm became a state university. The university has about 28 000 students and there are four faculties. The Faculty of Natural Sciences has departments of analytical chemistry, basic chemical education, biochemistry, organic chemistry and inorganic physical and structural chemistry.

The Department of Inorganic, Physical and Structural Chemistry is located in the Arrhenius Laboratory at the University of Stockholm. The Head of Department is Peder Kierkrgaard, who is

The Swedish National Museum of Science and Technology includes an exhibition of the history of chemistry.

Chairman of the Organizing Committee of the 32nd IUPAC Congress. His research interests include: structure, conformation and chirality of biologically important molecules; systematic X-ray structure analysis and design of new neutral host neutral guest inclusion compounds (coordinatoclathrates); Structural studies of organometallic compounds; metal cluster compounds; structural studies of divalent metal oxosalts.

The Swedish National Museum of Science and Technology

The Swedish National Museum of Science and Technology in Stockholm is the centre for technological history in Sweden. The museum conducts an active programme of research and documentation together with collection of, for example, artefacts, archives and illustrations in order to preserve our knowledge of Swedish technology and technical development.

The different permanent exhibitions at the Museum illustrate Swedish technical and industrial history. The museum's departments include mining technology and iron production, steam engines, automobiles and aviation, domestic technology, forest industry and the history of electricity and chemistry.

The museum's chemistry exhibition illustrates the origins of chemistry with exhibits of dyes, cooking and drugs and important discoveries. The exhibition ends with a survey of Swedish chemical industry of yesterday and today.

Conferences

Inorganic materials at high temperatures

Gaithersburg, Maryland, USA, 3-7 April 1989

IUPAC SPONSORED

The 6th International Conference on High Temperatures: Chemistry of Inorganic Materials, will be held at the National Institute for Standards and Technology, Gaithersburg, Maryland, which is located Northwest of Washington, DC, USA.

The purpose of this triennial conference is to review international progress in the pure and applied chemistry aspets of materials at high temperatures. The scientific programme includes plenary, invited and contributed lectures as well as poster presentations. The main session topics and plenary lectures include:

- Thermochemistry and phase equilibria modelling (I. Ansara, France).
- Clusters as materials intermediates (A. Kaldor, USA).
- Mechanisms for CVD and related materials-forming processes (K. Spear, USA).
- High temperature corrosion and oxidation (R. Rapp, USA).
- Laser-materials interactions (D. Olander, USA).
- Chemistry-based materials databases (L. Gurvich, USSR).
- New developments in instrumentation and theory for materials chemistry at high temperatures.

The symposium will be conducted in English and approved papers will be published in a special conference proceedings: plenary lectures will also be published in *PAC*. The registration fee of USD 270, with a reduced fee of USD 170 for students, will

National Institute for Standards and Technology, Gaithersburg, Maryland, USA, venue of the 6th International Conference on High Temperatures: Chemistry of Inorganic Materials.

cover the scientific and social programme costs in addition to conference publications, local transportation, lunches and refreshments. IUPAC affiliates are entitled to a 10% reduction of registration fee. Accommodation is available at local hotels at rates ranging from USD 30 to USD 80.

The climate will be spring-time with temperatures around 20°C (daytime) and 10°C (evening); occasional rain may be expected. The conference location is convenient to Washington DC by a new metro subway and downtown Washington is well known for its parks, monuments, museums, art galleries, theatres and as the seat of the Nation's Government.

Molecular design of functional polymers

Seoul, Korea, 26-28 June 1989 IUPAC SPONSORED

The main purpose of the International Symposium on Molecular Design of Functional Polymers, which will be held at Hotel Lotte, Seoul, is to promote interactions among polymer scientists of the world as well as to stimulate discussions on the recent scientific developments in the subject area.

The symposium will deal specifically with the molecular design of functional polymers such as polymer membrane, photoresist, biomedical polymers, conductive and piezoelectric polymers, polymers with non-linear optical properties etc. Specific synthetic methods to control the molecular and supermolecular structures of the functional polymers as well as the liquid crystalline polymers will also be included.

The symposium will consist of 20 to 30 plenary and invited lectures and approximately 200 original papers. There will also be post-symposium tours of the Ulsan Petrochemical Complex and the Daeduk Science Town.

The topics for the contributed papers are:

1. Synthetic methods for the control of structure. This topic includes liquid crystalline polymers.
2. Polymers for separation processes.
3. Photosensitive polymers.
4. Biomedical polymers.
5. Polymers with specific electrical properties.

The official language of the symposium will be English. No arrangements will be provided for simultaneous translation.

The registration fees are (before/after 31st March 1989): active participants USD 200/250; accompanying persons USD 70/100; students USD 100/125. Social events include a welcoming reception and a banquet.

Accommodation in Hotel Lotte and other hotels near the symposium site has been reserved for participants. The approximate rates range from KRW 24 200 to KRW 48 500 for single rooms.

Seoul is quite warm and humid in June. The temperature ranges from 24°C to 30°C. Summer clothes will suffice.

Quantitive luminescence spectrometry in biomedical sciences

The 3rd International Symposium on Quantitative Luminescence Spectrometry in Biomedical Sciences will be held at the State University of Ghent, Belgium, 23-26 May 1989.

Further information from: Dr Willy R. G. Baeyens, Symposium Chairman, State University of Ghent, Pharmaceutical Institute, Laboratory of Pharmaceutical Chemistry and Drug Quality Control, Harelbekestraat 72, B-9000 Ghent, Belgium.

AIDS

A global challenge:

> "Aids respects no geographic, political, social or economic boundaries. Successful control of this pandemic will require an unprecedented, world-wide effort. Scientists, educators, and decision-makers must work together to give to the peoples of the world the knowledge, understanding, and means to prevent and treat the infection and deal with its consequences."

The 5th International Conference on AIDS: The Scientific and Social Challenge will be held at the Montreal Convention Centre, Canada, 4-9 June 1989. It is sponsored by the International Development Research Centre, Health and Welfare Canada and World Health Organization.

The conference, which is the fifth in the series of international conferences that began in 1985, aims to bring together leading researchers in the various disciplines concerned with HIV infection and AIDS. The conference programme will focus on:

- Developments in bio-medical and social sciences
- Social, economic and political implications of AIDS.

Further information from: Secretariat: Kenness Canada Inc., PO Box 120, Station B, Montreal, Quebec, Canada, H3B 3JS.

Crystal growth

The 9th International Conference on Crystal Growth (ICCG-9) will be held in Sendai, Japan, from 20-25 August 1989. The conference is sponsored by the International Organization of Crystal Growth (IOGC). The theme of the conference is "Progress in science and technology of crystal growth" from electronic materials to biocrystals.

The conference will be followed by the 7th International Summer School on Crystal Growth (ISSCG-7) to be held at Zao hot spring village, Yamagata, Japan, 26-31 August 1989.

Further information from Prof. T. Nishinaga, ICCG-9 General Secretary/Prof. H. Komatsu, ISSCG-7 Chairperson: c/o Inter Group Corpora-tion, Akasaka Yamakatsu Bldg, 8-5-32, Akasaka, Minato-ku, Tokyo 107, Japan.

Carbohydrates

The 5th European Symposium on Carbohydrates (EUROCARB V) will be held in Prague, Czechoslovakia, 21-25 August 1989. The scientific programme will cover all aspects of the chemistry, biochemistry and technology of carbohydrates:

- Synthesis: monosaccharides, oligosaccharides, polysaccharides, nucleosides, antibiotics, carbohydrates as chiral synthons.
- Determination of structure: physical and analytical methods.
- Biochemistry: biosynthesis; biological role of saccharides, glycoconjugates, lectins, enzymes.
- Industrial applications and biotechnology of carbohydrates.

All correspondence should be addressed to the chairman of the organizing committee: Miloslav Cerny, Faculty of Sciences, Charles University, Albertov 2030, 128 40 Prague 2, Czechoslovakia.

Organic chemistry

The 6th European Symposium on Organic Chemistry (ESCO VI) will be held in Belgrade, Yugoslavia, 3-8 September 1989. The Serbian Chemical Society acting on behalf of the Union of Yugoslav Chemical Societies will host the meeting. In addition to plenary sessions, there will be three main sections: synthetic organic chemistry; physical and theoretical organic chemistry; and bioorganic chemistry and natural products.

Further information from: Prof. D. Vitorović, ESCO 6 Secretariat, Department of Chemistry, University of Belgrade, PO Box 998, 11001 Belgrade, Yugoslavia. Telex: 11176 IOFH YU.

Gas separation technology

The International Symposium on Gas Separation Technology will be held in Antwerp, Belgium, 10-15 September 1989.

The symposium will deal with both fundamental aspects and practical applications of gas separation and purification. Major emphasis will be put on the latest development in these fields using sorbents, membranes, cryogenic techniques and chemical processes (including catalysis). A special session will be devoted to accurate gas measurements.

For further information contact: Dr R. Dewolfs (Secretary), University of Antwerp (U.I.A.), Dept. of Chemistry, Universiteitsplein 1, B-2610 Antwerp-Wilrijk, Belgium.

Organobrominated compounds

The International Conference on Chemistry of Organobrominated Compounds and Their Uses will be held in Mulhouse, France, 3-6 October 1989. The conference is being organized by Sociėtė Française de Chimie, Alsace-Mulhouse Section. It will deal with uses of bromine in organic chemistry and all aspects of the synthesis and uses of organobrominated compounds.

Further information from: M. Jean Klapuch, Sociėtė Française de Chimie, ENSC Mulhouse, 3 rue Alfred Werner, 68093 Mulhouse Cedex, Franc.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in brackets.

1989

Oils, Fats and Waxes

12-17 February. International Conference on Oils, Fats and Waxes. Auckland, New Zealand.
(Mrs Jennifer Gray, Conference Secretary, Fats for the Future II, c/o Chemistry Department, University of Auckland, Private Bag, Auckland, New Zealand.)

Inorganic Materials at High Temperatures

3-7 April. Sixth International Conference on High Temperatures: Chemistry of Inorganic Materials at High Temperatures. Gaithersburg, Maryland, USA.
(Dr J. W. Hastie, Group Leader, High Temperature Chemistry, National Bureau of Standards, Gaithersburg, MD 20899, USA.)

Cationic Polymerization

5-9 June. Ninth International Symposium on Cationic Polymerizations and other Ionic Processes. Strasbourg, France.
(Secretariat of the 9th Symposium on Cationic Polymerizations, Institut Charles Sadron (CRM/EAHP), 6 Rue Boussingault, 67083 Strasbourg Cedex, France.)

Fats

6-9 June. International Congress Chevreul or Study of Fats. Angers, France.
(Chevreul International Congress Angers 1989, Centre de Congres, 33 boulevard Carnot, 49100 Angers, France.)

Molecular Design of Functional Polymers

26-28 June. International Symposium on Molecular Design
of Functional Polymers. Soeul, Korea.
(Secretariat, IUPAC International Symposium, c/o Polymer Society of Korea, Rm 601, Hyecheon Building, 831 Yeoksam-dong, Kangam-ku,
Seoul 135-792, Korea).

Coordination Chemistry

2-7 July. 27th International Conference on Coordination Chemistry. Queensland, Australia.
(XXVII ICCC Conference Secretariat, UniQuest Limited, University of Queensland, St. Lucia, Queensland 4067, Australia.)

Phosphorus Chemistry

3-8 July. 11th International Conference on Phosphorus Chemistry. Tallinn, USSR.
(Prof. M. Veiderma, Technical University, 5 Ehitajate Road, Tallinn 200108, Estonian SSR, USSR.)

Polymer Blends

17-20 July. 32nd Microsymposium on Macromolecules "Polymer Blends". Prague, Czechoslovakia.
(Dr P. Cefelin, PMM Chairman, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovskeho n. 2, 16206 Prague 6-Petriny, Czechoslovakia.)

Heteroatom Chemistry

17-22 July. Second International Conference on Heteroatom Chemistry (ICHAC-2). Albany, New York, USA.
(Prof. E. Block, Chairman, ICHAC-2, Department of Chemistry, State University of New York at Albany, Albany, NY 12222, USA.)

Bioinorganic Chemistry

24-28 July. Fourth International Conference on Bioinorganic Chemistry. Cambridge, Massachusettes, USA.
(Prof. K. D. Karlin, Chairman, ICBIC-4, Department of Chemistry, SUNY at Albany, Albany, NY 12222, USA.)

Analytical Chemistry

30 July-5 August. SAC 89: International Conference on Analytical Chemistry. Cambridge, UK.
(Miss P.E. Hutchinson, Secretary of the Analytical Division, Royal Society of Chemistry, Burlington House, London W1V 0BN, UK.)

IUPAC Congress

2-7 August. 32nd IUPAC Congress. Stockholm, Sweden.
(IUPAC c/o Stockholm Convention Bureau, Box 6911, S-102 39 Stockholm, Sweden.)

Solution Chemistry

6-11 August. 20th International Conference on Solution Chemistry. Jerusalem, Israel.
(Secretariat XX ICSC, PO Box 50006, Tel Aviv 61500, Israel.)

IUPAC General Assembly

9-17 August. 35th IUPAC General Assembly. Lund, Sweden.
(The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.)

Heterocyclic Chemistry

13-17 August. 12th International Congress of Heterocyclic Chemistry (ICHC). Jerusalem, Israel.
(Prof. A. Hassner, Department of Chemistry, Bar-Ilan University, Ramat-Gan 52100, Israel.)

Novel Aromatic Compounds

20-25 August. 6th International Symposium on Novel Aromatic Compounds. Tonaka, Osaka, Japan.
(Prof. Hiizu Iwamura, General Secretary of INSA-6, Department of Chemistry, Faculty of Science, The University of Tokyo, Bunkyo-ku, Tokyo 113, Japan.)

Calorimetry and Chemical Thermodynamics

25-28 August. International Conference on Calorimetry and Chemical Thermodynamics. Beijing, China.

Visas

It is a condition of sponsorship that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all *bona fide* chemists from throughout the world to attend irrespective of race, religion, or political philosophy.

IUPAC sponsorship implies that entry visas will be granted to all *bona fide* chemists provided application is made not less than three months in advance. If a visa is not granted one month before the meeting the IUPAC Secretariat should be notified without delay by the applicant.

(Prof. Hu Ri-heng, Institute of Chemistry, Academia Sinica, Beijing, China.)

Mössbauer Effect

4-8 September. International Conference on the Applications of the Mössbauer Effect. Budapest, Hungary.
(ICAME '89, Central Research Institute for Physics, H-1525 Budapest, PO Box 49, Hungary.)

Plasma Chemistry

4-8 September. 9th International Symposium on Plasma Chemistry. Pugnochiuso, Italy.
(Secretariat, ISPC-9, Centro Internazionale Congressi, V.le Papa Pio XII, 18-70124 BARI Italy.)

Electrochemistry

17-22 September. 40th International Society of Electrochemistry Meeting. Kyoto, Japan.
(Prof. Yasuhiko Ito, Department of Nuclear Engineering, Faculty of Engineering, Kyoto University, Sakyo-ku, Kyoto 606, Japan.)

Nitroxide Radicals

18-22 September. International Conference on Notroxide Radicals (INCR-89). Novosibirsk, USSR.
(Prof. L. B. Voldarsky, Institute of Organic Chemistry, Siberian Division of the Academy of Sciences of the USSR, Novosibirsk 630090, USSR.)

Organometallic Chemistry

1-6 October. Fifth International Symposium on Organomettallic Chemistry Directed Toward Organic Synthesis OMCOS V). Firenze, Italy.
(Prof. G. Casnati, Dipartimento di Organica "Ugo Schiff", Universita Degli Studfi di Firenze, Via Gino Capponi 9, 50121 - Frienze, Italy.)

1990

Natural Products

4-9 February. 17th International Symposium on the Chemistry of Natural Products. New Delhi, India.
(Prof. Sukh Dev, Malti-chem Research Centre, Nandesari, Baroda-39340, India.)

Polymer Analysis and Characterization

Spring. Third International Symposium on Polymer Analysis and Characterization. Dresden, German Democratic Republic.
(Dr Howard G. Barth, Du Pont Company, Experimental Station, Wilmington, Delaware 19898, USA.)

Porous Solids

6-9 May. Second International Symposium on Characterization of Porous Solids (COPS-2). Alicante, Spain.
(Prof. F. Rodríguez-Reinso, Departamento de Química Inorgánica e Ingeniería Química, Facultad de Ciencias, Universidad de Aicante, Apartado 99, Alicanti, Spain.)

Macromolecules

8-13 July. 33rd IUPAC Symposium on Macromolecules. Montreal, Canada.
(Prof. R. E. Prud'homme, Department of Chemistry, Laval University, Sainte-Foy, Quebec, Canada G1K 7P4.)

Organic Synthesis

23-27 July. 8th International Conference on Organic Synthesis. Helsinki, Finland.
(Prof. Tapio Hase, Department of Chemistry, University of Helsinki, Vuorikatu 20, SF-00100 Helsinki, Finland.)

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Pesticide Chemistry

5-11 August. 7th International Congress of Pesticide chemistry. Hamburg, Federal Republic of Germany.
(Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Physical Organic Chemistry

6-10 August. 10th International Conference on Physical Organic Chemistry. Haifa, Israel.
(Prof. Yitzhak Apeloig, Department of Chemistry, Technion-Israel Institute of Technology, Haifa, 32000, Israel.)

Chemistry of Oxide Superconductors

Edited by **C. N. R. Rao** FRS,
Solid State and Structural Chemistry Unit,
Indian Institute of Science, Bangalore, India

IUPAC
Published on behalf of the International Union of Pure and Applied Chemistry by Blackwell Scientific Publications

Although superconductivity was discovered as early as 1911, the highest transition temperature achieved up until 1987 was around 23 K. It appeared as though 23 K was the upper limit for the superconducting transition temperature. This situation changed suddenly, however. Oxides of the La-Ba(Sr)-Cu-O system possessing the K_2NiF_4 structure were found to show superconductivity in the 30–40 K region early in 1987. Soon after, $YBa_2Cu_30_7$ possessing the defect perovskite structure as well as other rare earth cuprate derivatives with a similar formula were found to exhibit superconducting transitions at 95 ± 5 K, well above the liquid nitrogen temperature. Several other oxides showing high-temperature superconductivity have since been identified, especially the bismuth and thallium cuprates (85–125 K), and there are indications that we may reach even higher transition temperatures in the near future.

This book is intended to highlight the chemical aspects of oxide superconductors, giving an idea as to how solid-state chemistry (structure, bonding and stoichiometry) plays a crucial role in the superconductivity of these high-temperature oxide superconductors.

***Outline of Contents*:**

Chemistry of high-temperature oxide superconductors; The role of crystal chemistry for generation of high T_c oxide superconductors; $Ba(Pb, Bi)O_3$ superconductors and their relationship to the copper oxide based superconductors; Chemistry and high T_c superconductivity in the La-Ba-Cu-O system; Synthesis, structural chemistry and properties of $YBa_2Cu_30_{7-x}$; High T_c superconductivity in $LnBa_2Cu_30_7$ (Ln = La-Yb, Y) compounds; Chemistry-T_c relations in oxide superconductors; Thermal decomposition studies of $YBa_2Cu_30_{7-x}$ using beam modulation mass spectrometry; Kinetics of oxygen uptake in $YBa_2Cu_3O_x$; The role of oxygen in $YBa_2Cu_3O_{7-8}$; Are one-dimensional structural features essential for superconductivity at 90 K?; Isoelectronic analogs of the high temperature oxide superconductor; Substitutional chemistry of the 1:2:3 phase and studies of the Y_2O_3-SrO-CuO phase diagram; Theory of superconductivity in systems with strong Coulomb correlations, with applications to the organic and oxide superconductors; Raman scattering studies of the copper-oxygen vibrations and oxygen order in La, Y-Ba, Sr-Cu oxides; A simple method to prepare high T_c superconducting thin films: pulsed laser deposition; High-temperature superconductivity in bismuth and thallium cuprates.

1988. 208 pages, 178 illustrations. **£22.50/$35.00** ISBN 0 632 02302 3

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Nomenclature of Inorganic Chemistry

New Third Edition

Edited for the International Union of Pure and Applied Chemistry by
G.J. Leigh

Chemical nomenclature has attracted attention since the beginning of chemistry, because the need to exchange knowledge was recognised from the early days. The Greeks, for example, gave names to ores and minerals and to the products extracted from them, such as metals and alloys; alchemists also felt it necessary to give names and symbols to their compounds. Later, Lavoisier's chemical treatise proposed a nomenclature for oxoacids. The need to exchange information and therefore propose nomenclature has persisted and the responsibility for providing nomenclature to the chemical community has been assigned to the International Union of Pure and Applied Chemistry, whose *Rules for Inorganic Nomenclature* have been published and revised in 1958 and 1970.

Since then many new compounds have appeared, particularly with regard to coordination chemistry and boron chemistry, which were difficult to name from the 1970 *Rules*. Consequently, the IUPAC Commission of Nomenclature on Inorganic Chemistry decided to thoroughly revise the latest edition of the 'Red Book'. Because many of the new fields of chemistry are very highly specialised and need complex types of name, the revised edition will appear in two parts. Part 1 will be mainly concerned with general inorganic chemistry; Part 2 with more specialised areas such as strand inorganic polymers and polyoxoanions.

This new edition represents Part 1; in it can be found rules to name compounds ranging from the simplest molecules to oxoacids and their derivatives, coordination compounds, and simple boron compounds.

Outline of contents:

General aims, functions, and methods of chemical nomenclature; Grammar; Elements, atoms and groups of atoms; Formulae; Names based on stoichiometry; Solids; Neutral molecular compounds; Names for ions, substituent groups and radicals, and salts; Coordination compounds; Boron hydrides and related compounds; Tables; Appendix.

Third Edition. Spring 1989. About 300 pages, 286 illustrations.
Cloth about £40.00, Paper about £19.95

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IUPAC Handbook 1987-1989

Published for the International Union of Pure and Applied Chemistry by Blackwell Scientific Publications Ltd

IUPAC

The 1987-1989 IUPAC Handbook contains not only the membership of Standing Committees, Divisions, Commissions, etc., but also the projects on which the IUPAC bodies are working. The Statutes and Bylaws of the Union and the Rules and Terms of Reference of the Divisions/Commissions are reproduced in toto. The Handbook is intended to provide detailed information on the membership, working programmes of the Union, and rules of operation in one volume, and will be a useful reference source for chemists and chemical organizations worldwide.

Outline of Contents:

Organization of IUPAC 1987-1989; Table of contents for membership lists; International Union of Pure and Applied Chemistry; IUPAC officers and secretariat; Past officers of IUPAC; General assemblies and congresses of IUPAC; Membership lists of IUPAC bodies 1987-1989: National adhering organizations; Observer countries; Associated organizations; Company associates; Executive committee and bureau; Standing committees; Divisions and their commissions, subcommittees, working parties and sub-groups; Standing orders from executive committee; Alphabetical index to members of IUPAC bodies 1987-1989; Current programmes 1988: Guidelines for IUPAC programmes; Standing committees; Divisions; Appendix 1 — Reports published 1986-1987; Appendix II — Sponsored symposia (as at 1 May 1988); Appendix III — Procedure for comment and approval of IUPAC recommendations on nomenclature and symbols. Minutes of 34th Council meeting; Statutes and Bylaws; Appointment and functioning of national representatives on IUPAC bodies; Rules of divisions: Terms of reference for divisions and commissions; Affiliate membership scheme; List of abbreviations; Stop Press.

1988. 288 pages. £25.00/US$32.00. Members Discount Price £12.50/US$16.00 ISBN 0 632 02383 X

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 44 countries, each represented by a national organization, such as an academy of science or research council.

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Chemistry International

IUPAC

1989, Vol. 11, No. 1 (January)

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The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

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Front cover: Water, the *sina qua non* of life: water management in Sudan. A farmer firms up the muddy banks of a small irrigation canal in a sorghum field. *(Photo by F. Mattioli, courtesy FAO.)*

1988 International Union of Pure and Applied Chemistry

Physics takes a chemistry lesson

The science of chemistry has a rather fusty air these days, lacking the glamour and popular appeal of particle physics or molecular biology. But, as an account in the current issue of the journal *Science* (Vol. 241, pp. 1053–7), makes clear, modern chemists are concerned with much more than simply cataloguing what is produced when chemicals are mixed together. Using lasers and electronic instruments, they are trying to make snapshots of chemical reactions in progress, breaking down the almost instantaneous conversion of one molecule to another into a series of steps, each lasting as little as one ten-millionth of a second.

A molecule is a collection of atoms, the individual units of the chemical elements, held together in a certain way. When a chemical reaction occurs, the reacting molecules swap atoms or groups of atoms, and rearrange themselves differently.

In principle, some physicists are fond of saying all such chemistry can be reduced to an application of quantum mechanics. Each atom has a tiny central nucleus surrounded by a cloud of orbiting electrons. The reason that atoms stick together as molecules is because some of the electrons take up new orbits around two or more atoms, forming "bonds" between them. So because we know all the equations that determine how electrons behave, say the physicists, we can predict what orbits they will form, what molecules will be made, and what reactions between molecules will or will not occur.

The problem is that although the equations for electrons orbiting around a number of different atoms can be written down, they are far too complicated to be solved. So instead of physicists reducing all of chemistry to mere calculation, the chemists are using their specialized knowledge to begin to understand the nature of chemical bonds, and thus help physicists understand quantum mechanics better.

In this week's *Science*, Kevin Peters and Gary Snyder, of the University of Colorado, describe new laboratory techniques which allow chemists to observe some of the microscopic changes that

Chemists are using their specialized knowledge to help physicists understand quantum mechanics better.

happen when one bond breaks and a new one forms. The particular kind of reaction they study is photoinduced — in other words, triggered by light. The substances they are investigating are mixed together in a solution and kept in the dark until a brief flash of laser light, lasting less than one thousand-millionth of a second, starts the reaction going.

When a bond between atoms breaks, a tiny amount of energy is given off. This release of heat makes the solution expand a little just in the vicinity of the reacting molecules, and the expansion pushes on the cooler liquid next to it and sets it moving. The net result is that a vibration — a sound wave — is set off, just as if the test tube had been very gently tapped. The experimenters can detect this sound wave with a very sensitive microphone, and its magnitude measures the amount of energy released.

Of course, after the complete reaction has finished, it is easy to measure the temperature of

the whole solution, and find out how much heat in total was given off. But in a complicated reaction there may be many bonds broken and many new ones formed, and measuring the final temperature change says nothing about any of these intermediate steps. With this new technique chemists can find how much energy is released in a single stage of the reaction, when one bond has broken but before any new ones have formed.

This modern kind of chemistry, whose goal is to find the exact sequence of events that constitutes a reaction between two molecules, should help quantum physicists in their efforts to "predict" the way molecules behave. But biologists, too, are looking in this direction: in the fight against Aids, for example, it is essential to know the precise sequence of interchanges by which the complex molecules of the body's immune system respond to the equally complex molecules of invading viruses.

The above item by David Lindley appeared in The Times, *31 August 1988 and is reprinted by permission of Nature-Times News Service 1988.*

News & Views

National subscriptions to IUPAC

The IUPAC treasurer, Prof. Anders Björkman, has written a letter to national adhering organizations (NAOs) concerning national subscriptions to IUPAC. The following is the text of his letter:

As you may know, budget planning is now initiated much earlier than has been done previously. By this improvement it was possible for the first time at the 1987 general assembly (Boston), to outline in more detail the needs for main expenditures in the biennial budget proposal, particularly the money to be allocated to IUPAC bodies (committees and commissions).

The budgets for 1988/89 could be established with a very small rise in total subscriptions, in spite of a substantial increase in allocations to IUPAC bodies. Indeed, the total subscriptions will, by the end of 1989, have stayed virtually at the same level for six years. A main reason for this favourable state of affairs has been the increased income from assets (interests and dividends) and publications. Both investments and publications have been subject to enlarged attention during recent years, but further income increases from these sources are hardly likely.

However, as explained at the recent Bureau meeting in Oxford (September 1988), the 1990/91 budget proposal will almost certainly contain a rise in total subscriptions, say up to 10%. Main reasons for needing increased subscription income are:

- Some IUPAC bodies tend to be starved of funds.
- New activities have been decided (Section on Medicinal Chemistry) and others are being approved (advanced materials).
- A provision should be made to enhance the commencement of a new period of CHEMRAWN endeavours.

Furthermore the financial predictions are:

- Less income from assets, which have been comfortably large during a number of years, but are expected to decrease.
- Continued inflation world-wide.

With augmented activities planned by the Committee on Chemistry and Industry, it is expected that industry will show greater interest to participate as Company Associates, whereby more income can be derived to support national subscriptions. Also, the CA membership unit (USD 350) has stayed unchanged even longer than subscriptions and is ripe for an increase. It would, however, only take care of part of the required income rise to be expected.

The information given here is intended to be an early warning, in order to allow NAOs to take steps to consider increased subscription payments for the biennium 1990/1991.

Global convention on movements of hazardous wastes

In June 1987, the Governing Council of the United Nations Environment Programme (UNEP) approved the Cairo Guidelines and Principles for the Environmentally Sound Management of Hazardous Wastes. At the same time the UNEP Governing Council covened a working group of legal and technical experts to prepare a global convention on the control of the transboundary movements of hazardous wastes.

The *ad hoc* Working Group held its third session at the Palais des Nations, Geneva from 7 to 16 November 1988. The two previous meetings were held in Budapest, 27–29 October 1987 and Geneva, 10–12 August 1988. At the November meeting the group considered the fourth revised draft convention on the control of transboundary movements of hazardous wastes.

Hooked on medicinal chemistry

I am addicted to medicinal chemistry. I get high on it. – Sir James Black, winner of the 1988 Nobel Prize for Medicine.

New appointment for Edward Grzywa

Prof. Edward J. Grzywa, titular member of the CHEMRAWN Committee has been appointed the Director of the Industrial Chemistry Research Institute in Warsaw. He was formerly Minister of Chemical and Light Industry in the Polish Government.

The Industrial Chemistry Research Institute is the largest chemistry research institute in Poland. Founded in 1922, it has been engaged in diverse research work and development of new technologies. This work has resulted in a number of patent and licence rights, for example, on: the cyclohexanone process; the caprolactam process; the adipic acid process; and the polyphenylenoxide process.

Prof. Edward Grzywa

New JCBN chairman

On 1 January 1989, Prof. J. F. G. Vliegenthardt (Utrecht, Netherlands) succeeded Dr H. B. F. Dixon as Chairman of the IUB–IUPAC Joint Commission on Biochemical Nomenclature (JCBN). IUB is the International Union of Biochemistry.

Analytical chemistry competition

The 14th International Competition in Analytical Chemistry, sponsored by the Federation of European Chemical Societies was held from 5 to 8 September 1988 at the Department of Analytical Chemistry. Prague Institute of Chemical Technology, Czechoslovakia.

Twenty-five university teams – 20 from abroad – entered the competition. The winning team came from Eötvös University, Budapest. The individual winner, out of 75 competitors, was J. Hanzal from Charles University, Prague.

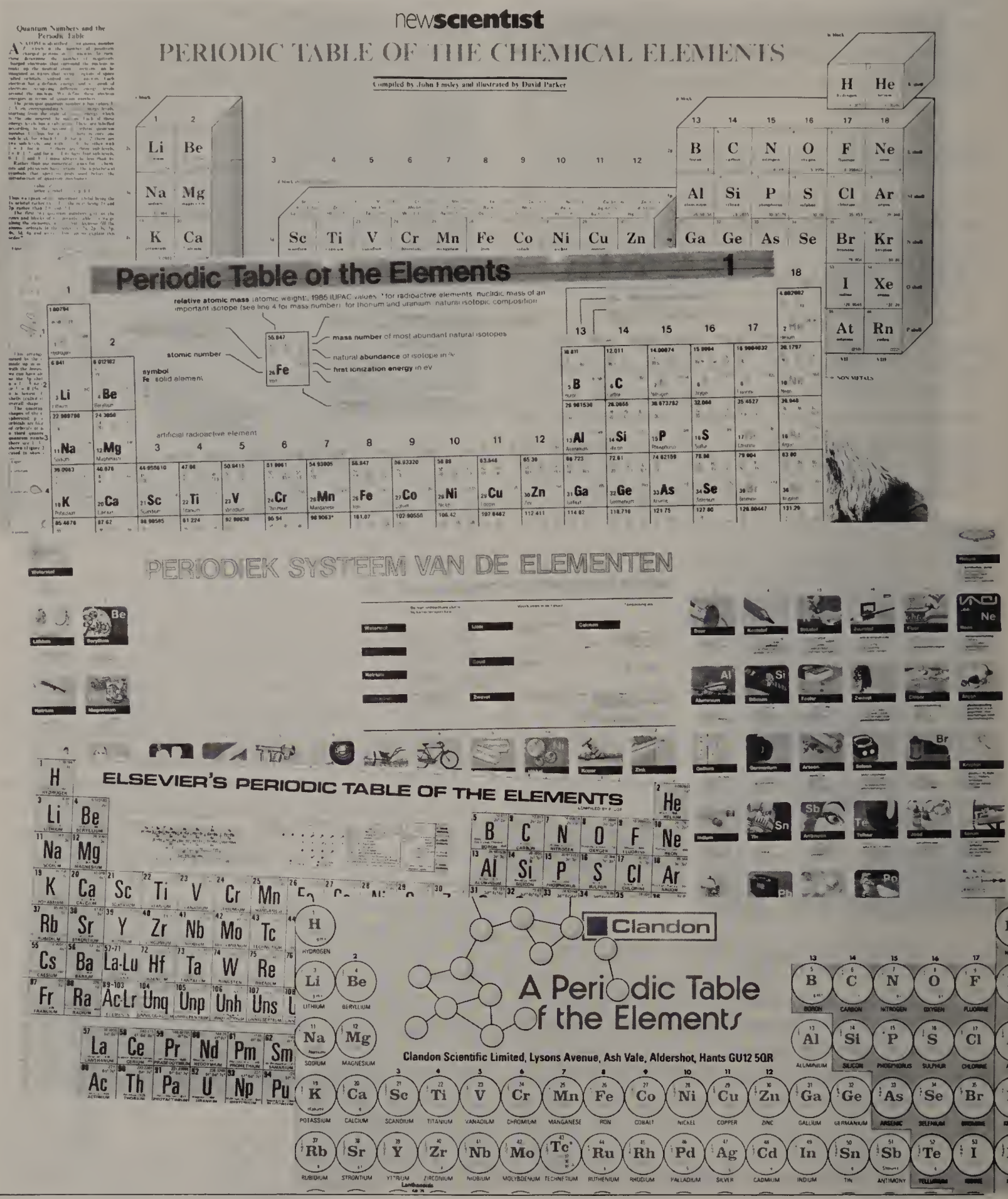
The 15th ICAC will also be held at the Prague Institute of Chemical Technology.

Opening ceremony of the analytical chemistry competition in Prague.

Beware! Gremlins at work

Dr Val Metanomski has spotted a mistake in our item on "Spot the difference" which appeared on page 199 of the September 1988 issue of *CI*. The structures were referred to as "lepidoterene" whereas the correct trivial name is "lepidopterene". As Dr Metanomski points out, the gremlins, who in the old days plagued the printers, are still at work, even in the environment of modern computerized word processors!

The 1–18 scheme for labelling the Periodic Table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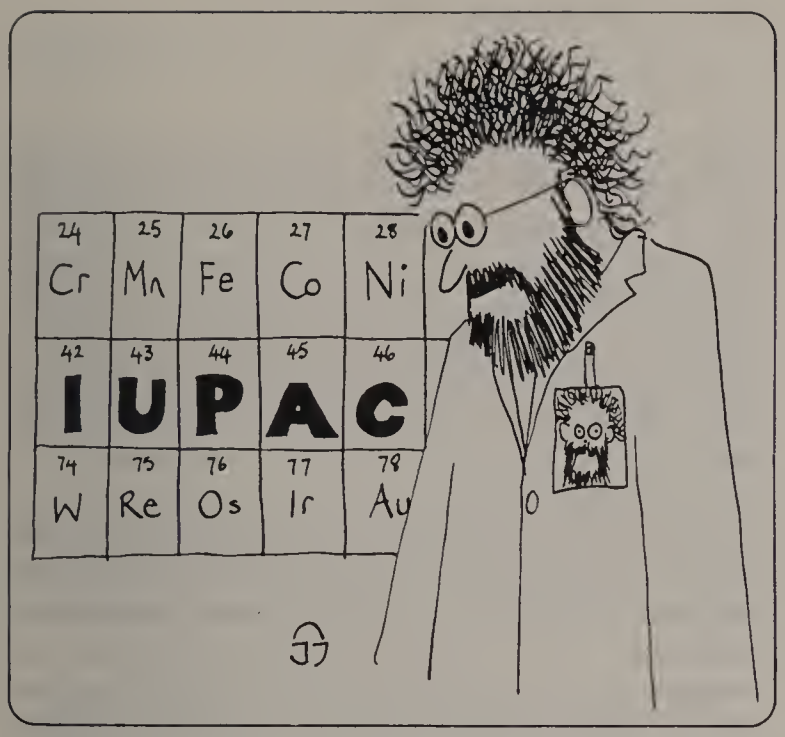
Since the Commission on Nomenclature of Inorganic Chemistry (CNIC) first suggested the 18 column numbering system as a means of resolving the contradictions in current usage, there has been a lively and sometimes heated discussion (see article by Daryle Busch on pages 59–62). The final recommendations may be some way in the future, but the 18 column system is being used more and more widely, and is being promulgated in Periodic Tables produced both by commercial and by national organizations. Some examples are displayed above.

In order to enable us better to judge how the CNIC suggestion is being received it would be very helpful if knowledge of examples of 18 column numbering in Periodic Tables could be forwarded to Prof. G. J. Leigh, c/o Information Officer, IUPAC Secretariat, Bank Court Chambers, 2-3 Pound Way, Cowley Centre, Oxford OX4 3YF, UK.



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Prof. Y. P. Jeannin (Vice-President). Fax: +33 (1) 43 54 40 97.

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Prof. H. R. Von Gunten (Secretary, Commission on Radiochemistry and Nuclear Techniques). Tel: +41 (31) 65 42 64 or +41 (56) 99 24 07. Fax: +41 (31) 65 44 99.

Letter to the Editor

Atomic weights

Sir,

Your reader, Sidney Toby (*CI*, Vol. 10, No. 6, p. 213, 1988) has touched on a recurring problem that IUPAC seems to face every decade, that is, the meaning of atomic weight.

The reports of the Commission on Atomic Weights (1969, 1971) created a controversy about which term was internationally acceptable: "atomic weight" or "relative atomic mass". In the commission's 1979 report, a new definition of atomic weight of an element from a specified source was approved as "the ratio of the average mass per atom of an element to 1/12 of the mass of an atom of ^{12}C". The term "mean relative atomic mass" was accepted as an alternative.

Starting with Dalton (see *CI*, Vol. 6, No. 1, p. 5, 1984) atomic weight values have always been ratios to some standard, whether H = 1 (Dalton, 1803), O = 100 (Berzelius, 1810), O = 16 (Deutsche Chemische Gesellschaft Atomic Weight Committee, 1900) or ^{12}C = 12 (IUPAP/IUPAC, 1960/1). From time to time, it is recommended that the term "relative" atomic weight be used but IUPAC has always considered "relative" to be redundant, since the concept of atomic weight implicitly incorporates that term.

Reader Toby confuses the atomic weight of an element with the elemental atomic mass and the molar mass. These values for oxygen would be 16.00 u (unified atomic mass units) and 0.01600 kg mol^{-1} (SI units), but not 16.00 g mol^{-1} in either case.

I am afraid that reader Toby's desk width is not as significant to trade and commerce as atomic weight values and thus does not require international agreement. However, he is free to express his desk width in either relative or absolute terms. One cannot say that a distance expressed in relative units is either more or less correct than that distance expressed in absolute units, assuming that the measurement was carried out to the same precision and with the same systematic uncertainties in both cases.

I conclude that this problem is caused by fuzzy thinking about the term atomic weight. Perhaps IUPAC should require the Commission on Atomic Weights and Isotopic Abundances (II.1) to periodically review the concept in their reports to insure that readers understand fully what is meant by the term atomic weight.

Norman E. Holden
Chairman, Commision on
Atomic Weights, 1979–1983

Organic chemists' affinity for organ music

Organic-chemist-organist (and IUPAC affiliate) Dr Douglas Lloyd at the organ of St Salvator's College Chapel, University of St Andrews, Scotland.

IUPAC affiliate Dr Douglas Lloyd gave a recital of organ music in St Salvator's College Chapel, St. Andrews University, Scotland, to members of the Commission on Oils, Fats and Derivatives (VI.3) during their 41st meeting, 16–18 August 1988 (see p. 18 of the January 1989 issue of *CI*).

This was the latest in a number of recitals Lloyd has given for international chemistry meetings held at St. Andrews. The last one before this was for the IUPAC-sponsored 5th International Symposium on Novel Aromatic Compounds (ISNA 5) in 1985.

Lloyd is an honorary reader in organic chemistry in the Department of Chemistry at the university. 1988 Nobel Prize winner in chemistry, Prof. Jean-Marie Lehn is another organic-chemist-organist who has played on the organ at St. Andrews. He gave several recitals when he was a visiting professor at the university.

Commission VI.3 is not the only commission that appreciates good organ music. When the Commission on Analytical Reactions, Reagents and Separations (V.1) met in Freiberg, GDR, during August 1988 (see also p. 18 of the January issue) they attended a performance by Hans-Dietier Schöne on the very large world-famous 18th century Silbermann organ in Freiberg Cathedral. The concert included classical and modern works.

It would seem that August 1988 was the month of organ music at IUPAC meetings. At the IUPAC-sponsored 14th International Carbohydrate Symposium held in Stockholm, Sweden, from 14th to 19th of the month, Bertram O. Fraser-Reid, James B. Duke Professor of Chemistry at Duke University, USA also gave an organ recital. The recital included the Chorale in E minor by César Franck and was given on the organ at the Church of St John. Fraser-Reid was plenary lecturer at the symposium. His paper reported on recent work with David R. Mootoo, a coworker at Duke University, on discoveries relating to new coupling methodology leading to synthesis of oligosaccharides.

The chemist–musician relationship has a long tradition. For instance, the renowned Russian composer Aleksander Borodin was a distinguished professor of chemistry at the Medico–Surgical Academy, St. Petersburg (now Leningrad). The British composer Edward Elgar is another example. Although Elgar's profession was music he was a keen student of chemistry and built and used a chemistry laboratory for recreaction.

Role of enzymes and micro-organisms

Dr Virinder Parmar, Reader in Organic Chemistry at the University of Delhi, India.

Indian affiliate Dr Virinder Parmar registered an interest in the work of the Commission on Biotechnology when he returned his blue affiliate registration form last year.

His current research interests at the University of Delhi, where he is Reader in Organic Chemistry, are in the areas of "role of enzymes and micro-organisms in organic synthesis agrochemicals and pharmaceuticals" and "chemistry of natural products". He has been teaching and guiding research in these areas for several years and published more than 50 research papers on these topics.

Parmer obtained his BSc, MSc and PhD degrees from the University of Delhi. Earlier he had worked at Cornell University (USA), University of Basel (Switzerland), Imperial College (London, UK) and Odense University (Denmark). In September 1985 he par-

ticipated at the 30th IUPAC Congress held in Manchester, UK.

Belgium joins IUPAC affiliate membership scheme

Belgium is now operating the IUPAC affiliate membership scheme. Starting this year, the "Société Royale de Chimie" has decided to include the scheme in its own membership affiliation system as an optional subscription.

For further information contact: Prof. Robert Fuks, General Secretary, Société Royale de Chimie, ULB Campus Plaine CP 206-4, Boulevard du Triomphe, B-1050 Brussels, Belgium.

Help needed for stability constants projects

The Commission on Equilibrium Data (V.6) needs volunteers to help enter stability constant data into their database through any IBM compatible micro. The commission would like to hear from those willing to search journals for stability constant data and from those willing to help in transferring data from sheets into a micro.

The commission would also welcome suggestions for systems for which critical evaluations of stability constants are needed.

For further information and name and address of commission chairman see report on page 66.

Participation of affiliates from non-member countries

At its meeting in Oxford in September 1988, the Bureau agreed that affiliates who have the necessary expertise and who come from non-member countries may in future become members of working parties or sub-committees of IUPAC commissions. Only chemists from member countries may be associate or titular members of commissions or members or national representatives on division committees at present (see "Secretary General's Column" p. 58).

Computer databases at the Beilstein and Gmelin Institutes

Stephen R. Heller

This article presents the computerized activities of the Beilstein and Gmelin Institutes, two of the most important and useful sources of high-quality scientific data available to chemists throughout the world. The factual and structure files of these two databases, both in hardcopy as well as computer readable forms, will be of considerable value to the chemical community in the future.

Introduction

Part of the educational activities of the Committee on Chemical Databases (CCDB) is to inform IUPAC members of interesting and significant computer activities. This is a part of the CCDB term of reference to promote a higher awareness of the application of computers in the management, dissemination, and uses of chemical data. The first article described online computer services[1]. This article is the second in a series the CCDB is providing to *Chemistry International*.

The shelves of a few thousand libraries around the world are home to hundreds and hundreds of volumes of the well-known and highly respected German works of the Beilstein and Gmelin handbooks[2]. Starting at the end of 1988, and continuing for the

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next few years, these two massive and important reference works will become even more well known and used as those two giants of chemical data and information become more active as the 20th century comes to an end.

Beilstein

At the end of 1988 parts of the *Beilstein Handbook of Organic Chemistry* became available online together with the connection tables structures for online searching. It is also now possible to lease these connection tables for search on in-house computers[3]. Thus, a new and computerized complementary resource for evaluated data of organic compounds is available to the scientific community. This will enhance the value of this unique scientific resource to the entire chemical community.

Dr Clemens Jochum (Beilstein Institute) is a member of CCDB.

The Beilstein database is really composed of two separate parts. These two computer-readable databases, the factual and structure databases, have been developed under the direction of Dr Clemens Jochum, a member of CCDB. The Beilstein databases became available on the DIALOG and STN systems in 1988, and are now available on the ORBIT and Datastar systems[4].

While the painful days of learning German and the complex and exacting Beilstein organizational rules were over when the SANDRA (Structure AND Reference Analyzer) computer program (written by Dr A. "Sandy" Lawson, a member of the IUPAC Publications Committee) was made available last year[5], one still needed to go to the multi-volume *Beilstein Handbook* to get the data and information. Within months this will begin to be no longer necessary for most (but not all) of the data one will be looking for in the *Beilstein Handbook*. While the database is going online in increments, full data for the group of large information compounds (LICs: those compounds with too much data and information to be usefully stored

Dr "Sandy" Lawson, member of the IUPAC Publications Committee, who wrote the SANDRA (Structure and Reference Analyzer) computer program.

online, such as benzene, aniline, and so forth) will never go online. Even so, it will certainly be a considerable improvement over what was the case in the past with the printed handbook volumes. The first increment to go online will be the heterocyclic compounds, with acyclic and carbocyclic compounds to follow over the next few years, so don't expect too much too soon.

So that *Chemistry International* readers don't misunderstand what Beilstein Online is and is not, it should be stated clearly that the database will be data and structure searchable. The original data from the Main or Basic (Hauptwerk) and Supplementary volmes (Erganzungswerk) I–IV which appear in German are still in German in the online version. (However most of the information from H–IV will be in English in the online version.) Nevertheless the names of all compounds which are still in German in the handbook are being translated into English for the online version. While only the data and information from the 5th Supplemental Series (E–V) onwards will be in English, this will, in fact, comprise the bulk of the information in the entire Beilstein database.

There will be some 400 different parameter fields or data elements in the factual portion of the database, most of which will be searchable, while one will be able to display all parameter fields. Of the 400 searchable factual fields about 60 are numerically searchable, some are searchable text fields (such as molecular formula, chemical names, and so forth), while the rest are searchable using keywords.

For example, one will be able to search for all compounds with a dipole moment within a specified range and for which there are also toxicity data. One could also search for a chemical which is a reaction product, or for starting materials of a reaction. Thus it will be possible to search for how to prepare 2-nitrothiophene using acetic anhydride as a starting material

and obtain the appropriate reaction conditions and literature citations. The immense number of useful parameters make it impossible to do justice to the content of the database in this brief article.

There will also be two parts to the online factual database, the Full File (completely evaluated data) and the Short File (not yet evaluated data). The Full File will consist of virtually all the data which have been printed in the handbook and which have been checked for errors and redundancies by the highly trained Beilstein staff. The Full File, of completely evaluated data, will consist of two types of compounds. In the Full File there will be the so-called large information compounds (LICs) and the short information compounds (SICs).

As stated previously, the LICs are compounds for which there is a considerable amount of information, which often has a number of pages in length in the handbook. The LICs comprise less than 2% of the total entries in the *Beilstein Handbook*. The SICs usually take less than a quarter of a page in the handbook.

The Short File, which is not to be confused with the SICs, will be made up of the abstracts from the primary literature which have not yet undergone the detailed checking which the *Beilstein Handbook* is so well known for. Factual data of the current literature will be added to the Short File on a regular basis. In this way Beilstein Online will be more up-to-date than the printed handbook volumes.

CCDB member Dr Leonhard Kiessling (centre) using Beilstein Online with Drs Jochem (left) and Lawson.

As a record is checked, it will be transferred to the Full File, and also printed in the latest and appropriate printed handbook volume. To distinguish between the Full File and the Short File, all Full File records will be noted in the online versions as "Handbook Data". (For the complete details about Beilstein Online searching, which are too lengthy to outline here, the reader is referred to the Beilstein Online Manual, available from the Beilstein publishers.[2]) All parameters can be displayed or printed, including the chemical structure of the compound.

While the database provided to the online vendors will be the same on all online systems, as each vendor will implement the database slightly differently owing to the different data and structure search software they use, one should carefully examine the features of a particular vendor prior to choosing which one you will use. As a final point it should be again noted that the first part of the *Beilstein Handbook* which went online in 1988 will be the heterocycles, Beilstein volumes 17–27, and the time covered will be from 1830 to the latest published volumes in the E–IV series.

While the cost of searching has not been announced, it is plausible to assume it will exceed the cost of the approximately USD150 per hour cost to search the CAS bibliographic databases online. The CAS database, which goes back (in an online form) only to the 1960s, whereas Beilstein goes back to 1830, does not give "hard" answers to a query, but rather "soft" and unevaluated answers (i.e. literature citations, not scientific data). Of course, CAS is more up-to-date in terms of literature citations than the *Beilstein Handbook*.

Organizations which subscribe to the printed Beilstein volumes will receive a respectable discount from the standard online prices of all vendors which make the Beilstein database available. Owners of the printed volumes will also benefit from a cost savings point of view from being able to use the PC (Personal Computer) SANDRA program, which runs on IBM and compatible computers, to find quickly a compound in the printed handbook volumes. Owners to the printed volumes who do a lot of searching online can also benefit from having the printed volumes since they will save money by getting the Beilstein volume numbers and page numbers from an online search without having to pay the considerable cost of typing or printing out a record online. Thus it would be best for someone to subscribe to the handbook and use the online service to have access to everything from Beilstein.

Inorganic Division President Ekkehard Fluck (left) is Director of the Gmelin Institute. Here he is seen with Dr Renée Deplangue.

Gmelin

The inorganic counterpart to the *Beilstein Handbook* is the *Gmelin Handbook*. While there has been considerable interest and publicity in the *Beilstein Handbook*, the scientists at the Gmelin Institute have been working in their usual efficient manner, under the direction of Prof. E. Fluck, a long standing member of IUPAC, and currently President of the IUPAC Inorganic Chemistry Division.

The *Gmelin Handbook of Inorganic Chemistry* is prepared by the Gmelin Institute, which is part of the Max-Planck Society. The handbook, now in its 8th edition, is composed of over 570 volumes with more than 180 000 pages of text which systematically cover the field of inorganic chemistry[2]. Since 1980 all the volumes have been published in English.

While the Beilstein computerization activities are done by the Beilstein staff in Frankfurt and their collaborators, the Gmelin Institute has chosen to establish a separate organization, Chemplex, to handle the computerization of the Gmelin database. While the Gmelin database will not be available online for a few years, Gmelin made the Gmelin Molecular Formula Index available in 1987, almost a full two years before the Beilstein database will be online.

The computerized version of the Gmelin Formula Index (GFI) consists of the 20 *Gmelin Handbook* index volumes plus the abstracts and bibliographic information from the Gmelin Catalog. A second supplement of eight volumes, containing references up to 1987, is now in preparation. About one half of this information has already been online on STN since early 1988 and is called GFI, Version 2.

GFI can be searched in a number of ways. These include the molecular formula using the Hill notation, by substance groups (such as solutions), by system components (such as $HAsO_2$–H_2O) and by keywords (such as electrochemical behavior). In addition, the database can be searched with Boolean logic to combine terms, such as element counts and molecular weights. Thus one can search for entries with a molecular weight between 250–260 and 6–8 atoms. The basic results of a search are the Gmelin volume number and page number from the printed handbook.

As for future computerization activities, a systems analysis was performed in 1985 and resulted in the decision to build a substance-orientated factual database. There will be logical data records connected to individual inorganic substances which will be searchable by structure, substructure, or molecular formula and by data parameter fields of various chemical and physical properties. As not all inorganic compounds can be represented by a structure, the Chemplex staff plans to develop methods which will allow searches for non-stoichiometric compounds, systems, diadochous compounds, and others.

The final database, which is not expected to become completely available until about 1991–1992, will contain data from four sources. The first is the evaluated data from the existing *Gmelin Handbook* volumes. The second is the chemical substances and factual data from the old literature which is not yet covered in Gmelin. There are no immediate plans to evaluate these data. The third source of data for the online Gmelin database is the chemical substances and factual data from the recent literature, similar to the Beilstein Short File. This information will then be checked, published in the printed *Gmelin Handbook* volumes, and then become part of the evaluated Gmelin database. The last source is the completely checked and evaluated chemical substances and evaluated data which are covered in the new *Gmelin Handbook* volumes.

The *Gmelin Handbook* and the online Gmelin database will independently continue to meet the information needs of the inorganic and organometallic chemist. The two products, hard copy printed volumes and online will continue to be complementary products, for which all chemists should have access to and use of both resources. In the handbook there will continue to be related information which is compiled at the same place and allows for a complete review of the material in question.

It is the information in context which catalyzes the reflection, the association of ideas, and has perhaps been the inspiration that makes up the innovative and creative thought process. Many new ideas have been inspired or stimulated by browsing through review-type literature. On the other hand, the online Gmelin database will allow quick access to numeric and alphanumerical data of elements, compounds, chemical systems, and furthermore, searches for substances possessing specific properties, for specified structural formula or structure fragments, and so forth.

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Secretary General's Column

Prof. Tom West

The Bureau met in Oxford in September 1988. The changing needs of chemistry and restructuring of the Union were amongst the topics discussed.

The previous Secretary General's Column (see *CI*, Vol. 10, No. 6, pp. 217–221) gave an account of some of the items discussed at the 111th IUPAC Executive Committee meeting in Moscow on 16–17 May 1988. There I explained that the Executive Committee prepares business for discussion by the Bureau, and the composition of the latter and it's overall responsibilities were outlined.

In this report I endeavour to give a brief account of one of the Bureau's main preoccupations at its 56th meeting in Oxford on 18–19 September 1988. I referred to this topic under the title "Perestroika IUPAC-style" in the previous column.

Secretary General Tom West (left) tries to attract the attention of President Valentin Koptyug (centre) as Treasurer Anders Björkman (right) makes notes at the Bureau meeting in Oxford.

IUPAC and the changing needs of chemistry

It is almost inevitable that an international scientific body which is largely concerned with topics such as nomenclature, units, symbols, codification and classification, which are frequently contentious, should, by virtue of its nature be somewhat slow moving in reaching decisions. This is so, because of its multiple nationality, its need to consult scientific opinion in a great number of very diverse countries, and its requirement to regulate and, as far as possible, to lead opinion by general consent rather than by imposition of the views of its experts.

This slowness is ruefully accepted by those chemists who are priviledged to serve in the Union. Outside IUPAC other chemists may frequently wonder, with greater justification, why things take so long and even feel frustrated by delays in apparently simple matters.

For example, why has IUPAC not yet decided which form of the Periodic Table of the Elements should be used as standard? Well, I think both the Inorganic Chemistry Division and its Commission on Nomenclature of Inorganic Chemistry know which form they would prefer, but their consultative document and subsequent articles and voluminous correspondence in the open literature revealed so many earnest, strongly held views, that the Union's dilemma is obvious. Longstanding conventions such as the various arrangements of the Periodic Table, which are to be found imbedded in institutions of secondary education, let alone universities and industry, are perhaps particularly difficult to regulate and even researchers look for different frequencies of properties.

Nevertheless this illustrates why the Union sometimes appears to be rather ponderous. However, whilst there may be some acceptance of examples such as that mentioned above, there is within the Union a feeling that it should be possible to react more quickly to some of the more modern "hot spots".

Prof. Heinz Staab listens intently during the Bureau meeting.

IUPAC's divisional structure was established after World War II, basically to cope with the rapidly expanding problems of nomenclature and so on, in analytical, applied, inorganic, macromolecular (then biological), organic and physical chemistry. Universities and chemical societies the world over are similarly organized to cope with their business in relation to chemistry. This arrangement of chemical disciplines seems still to be the optimal one, provided that the disciplines do not work in isolation from each other. I am happy to say that there is no such isolation in IUPAC, indeed one of our perpetual problems of recent years has been to find sufficient space in our general assembly timetable for the ever-increasing number of interdivisional commission meetings.

Be that as it may, the Bureau is aware that the divisional structure conveys a certain rigidity of programme, which makes it difficult for the Union to respond with speed and flexibility to new interdisciplinary matters within chemistry and, perhaps more seriously, those which involve chemistry and other sciences, such as physics and the biosciences.

Two examples may usefully be considered: biotechnology and the so-called high-temperature superconductivity.

Biotechnology. For several years a Commission on Biotechnology (earlier on Fermentation) existed in the Applied Chemistry Division. Following a vice-presidential review, it was decided that its programme was still orientated too much towards fermentation. Accordingly it was reconstituted and the programme reformulated to take account of what had been happening in molecular biology, genetic manipulation, and so on, and the effects of these on chemistry and chemical industry.

Nevertheless biotechnology is a vast subject, which touches and affects chemistry in many places. Questions were asked whether one commission could handle the subject. Therefore, at the Lyon General Assembly in 1985, all divisions were asked to outline their interests in the subject. All of them responded positively and it was agreed that each should pursue its own interests independently for the time being, whilst the Commission on Biotechnology (VI.2) sorted out its new programme.

However, a quick scan of the current programmes of all the commissions, as detailed in the *1987–89 IUPAC Handbook* (pp. 135–193) shows little visible activity other than the five projects of Commission VI.2. Is this evidence of a malaise in IUPAC — an inability to respond within a reasonable period of time, or is it simply that the commissions are too involved in their present programmes to drop some of these activities and commit resources to such a new task? There is a feeling that the latter may be the case and that something must, therefore, be done to break up some of the entrenched programmes, thus to release the required resources, not necessarily of course, for the biotechnology example cited here. Meanwhile, the Commission on Biotechnology has paid close heed to the IUPAC statutes, particularly S2.2, in drawing up its first five projects.

High-temperature superconductivity. This constitutes another interesting modern topic. In this case there are clearly chemical and physical considerations, though these days the materials scientist may contend with the solid-state chemist for priority of interest. Certainly in this field there is keen competition between chemists and physicists.

What, you may ask, is IUPAC doing in this area? Well, it has already made two notable contributions, namely the extremely successful and timely CHEMRAWN VI Conference on Advanced Materials for Innovations in Energy, Transport and Communications held in Tokyo, May 1987 and the recent publication of a book by Past-President Ram Rao entitled *Chemistry of oxide superconductors*.

The Union could clearly deal with problems of nomenclature in a rapidly developing area such as this, and some of the work in hand in the Inorganic Chemistry Division already borders closely on it. But, I should say here, perhaps that it is not the task of IUPAC to undertake actual research on superconduc-

Prof. Camile Wermuth, President of the Section on Medicinal Chemistry enjoying a cup of coffee during a break in the Bureau meeting.

tivity or any such topic. At least to the best of my knowledge, the statutes have never been so interpreted. Scientific research has always been regarded by the Union as the preserve of its members, the academies of science and the chemical societies, which are the national adhering organizations.

The statutes reveal IUPAC's prime tasks to be:

- to promote international cooperation between chemists (S2.1)
- to cooperate with other international organizations (S2.3)
- to contribute to the advancement of all aspects of chemistry (S2.4)
- to study topics of international importance which need regulation, standardization of codification (S2.2).

I have taken Statute 2.2 out of order because it is the most specific and was the principal concern of the forerunner organization of IUPAC (formed in 1919), i.e. the International Association of Chemical Societies, founded in the opening decade of the present century.

Restructuring within the statutes

In Oxford the Bureau discussed at length how IUPAC might be restructured so to be able to respond more readily and effectively to the changing needs of chemistry, and chemistry related to mankind's needs, without losing its ability to perform its present duties as set out in the statues. Many points were made, but the four main resolutions may be summarized as follows:

1. The divisional structure of IUPAC should be maintained, but within the divisions some restructuring of commissions should be instituted as soon as possible after the 1989 general assembly in Lund.
2. Each division should restructure according to its needs, after due approval by the Bureau, in order to more efficiently discharge its duties and particularly to place itself in a position to respond to the changing needs of chemistry especially on the interdisciplinary scene.
   2.1 Such changes should not disrupt the ongoing programme of the division: the evolution should be progressive.
   2.2 The introduction of limited lifetime subcommittees or commissions is desirable
3. The Executive Committee should act as a forward planning group for IUPAC as a whole. Its discussions in this respect should centre on the identification of new emerging topics in chemistry or chemistry-related sciences and the injection of such new programmes into the existing ones of the Divisions.
   3.1 The Executive Committee in this role should also be concerned with external relations with other unions of the International Council of Scientific Unions (ICSU) family, with ICSU itself and with the programmes of its scientific committees and special committees.
4. Whilst maintaining the present "vertical" disciplinary format of the divisions, a "horizontal" interdisciplinary mission-orientated structure, involving several divisions/commissions, should be introduced at the discretion of the Bureau.
   4.1 Ideally there should be at least three such horizontal programmes in place at any one time.
   4.2 These horizontal mission-orientated programmes should be of limited lifetime and would require priority funding.

At the time of the Bureau meeting, topics deemed worthy of consideration included:

- chemistry and the environment
- chemistry and the biosciences
- chemistry and safety
- new materials chemistry, e.g. molecular electronics
- evolution of a new systematic computer–compatible nomenclature system for chemical compounds with participation from computer specialists

Readers may find it interesting to see a list of some of the points brought forward during the debate:

- Discussions should take place with the United Nations Environment Programme (UNEP) on colla-

St. Peters College, Oxford, UK, venue of the September 1988 Bureau meeting.

borative efforts relating to chemistry and the environment.

- A series of books, *Chemistry for the 21st Century* should be planned and published.
- The Union should consider what it could do in relation to the poor image of chemistry perceived by the general public.
- Forums on IUPAC and its activities should be organized periodically at IUPAC-sponsored symposia, with each division taking responsibility to see that one such forum should be mounted every two years at one of its sponsored events.
- There should be provision of plastic-covered membership cards for IUPAC affiliates.
- The strength of IUPAC is the people involved in its programmes. This should be pursued so that the best experts are always sought and involved.
- A high-powered group of industrialists, Nobel laureates, etc., should be set up, in order to look from outside at IUPAC's structure. There was a suggestion that this might be funded by industry.
- The involvement of division committee members should be maximized by making them each responsible for the oversight of a commission's work.
- Division presidents might consider delegating powers to sub-division leaders, thus to free themselves for dealing with difficult or major problems.
- There should be increased publicity via the affiliate membership scheme to maximize awareness of IUPAC's goals and activities within the community of chemists.
- The role played by *Pure and Applied Chemistry* as the official journal of IUPAC should be reassessed.
- Consideration should be given to the establishment of bi- or multi-lateral symposia with other scientific unions.

The members of the Executive Committee agreed to have a full-day discussion at its spring meeting in 1989, to re-examine and amplify the matter of restructuring, with a view to instituting some of these Union-wide mission programmes as soon as possible after the 1989 general assembly, subject of course to further debate by the Bureau at its next meeting in Lund, August, 1989.

Other topics in brief

Because I have taken up so much space in discussing the subject of restructuring, there is little room left for an account of other business transacted at the Bureau meeting in September, 1988. However, some "Stop Press" type of coverage may be of interest.

Affiliate affairs. It was agreed that affiliates who have the necessary expertise and who come from non-member countries, may in future become members of working parties or sub-committees of commissions. Only chemists from member countries may be associate or titular members of commissions, or members of division committees at present.

South African affiliate member S. Z. Ndzuta (left), lecturer at the University of Fort Hare, in discussion with Secretary General Tom West during his recent visit to South Africa where he attended, by invitation, the meeting of the National Committee of IUPAC.

Brazil rejoins IUPAC. It was agreed, following provisional acceptance by the Council in 1987, that Brazil had formed a sufficiently broad-based National Committee for IUPAC, and that it could, therefore, be readmitted as a full member of the Union.

Adverse effects of chemical compounds. Proposals for an IUPAC initiative to meet problems connected with adverse effects of chemical compounds on the environment by the formation of a standing committee were discussed, and will be further debated at the next meeting.

IOCD recommended for Associate Membership of IUPAC. The Bureau, on the recommendation of the Executive Committee, resolved to propose to the Council that the International Organization for

Prof. Norman Sheppard, member of the Bureau and Executive Committee.

Chemical Sciences in Development (IOCD) should be granted Associated Organization status in IUPAC. IOCD is an active and prestigeous body with CHEMRAWN should form a powerful and effective team in relating chemistry to world needs.

Vice-presidential review pulls few punches. Vice-President Yves Jeannin's biennial critical review of divisional activities was not complete by the time of the Bureau meeting. Indeed he had only been able to interview the division presidents immediately before the meeting. Nevertheless, his preliminary assessment, based on written submissions, was a penetrating one. Some commissions had too many projects: others had projects that should have been finished some time ago: several of the interdivisional commissions appeared to be in need of better communications. In appreciation of some of the difficulties of interdivisional commissions being able to fit their meetings into an already overcrowded schedule at the biennial general assemblies, a suggestion was made that it might now be appropriate for them to meet immediately before each general assembly at the same venue.

CHEMRAWN atmospherics. The preliminary plans for the proposed CHEMRAWN VII conference "The Chemistry of the Atmosphere — Its Impact on Global Change" were presented by CHEMRAWN chairman John Thomas. An extensive programme to take place, probably in North America in 1990, foresaw the involvement of UNEP, WMO (World Metereological Organization) and ICSU. It was judged that the conference should be planned and effected in such a way that it would underline to governments and to the general public alike, the serious situation that could arise, and draw to their attention the role and vitality of chemistry in relation to such global issues and the leadership provided by IUPAC.

Safety in the production of chemicals. Dieter Wyrsch, chairman of the Committee on Chemical Industry (COCI) outlined more details of the programme of the proposed COCI Workshop on Chemical Safety, Basel, Switzerland during 10–14 September 1990, than was mentioned in *CI* 1988 Vol. 10, No. 6, p. 220. These were discussed by the Bureau and several suggestions were made for the consideration of COCI at its next meeting.

An invitation to all readers

Many other topics featured in an extremely busy Bureau meeting, but as mentioned already, I have chosen chiefly to feature the debate on restructuring and some of the background to it. I am sure that Bureau members would agree with my invitation to all IUPAC commission and division members, national respresentatives and affiliates to comment on their views on what IUPAC is doing in relation to restructuring or indeed what it is not doing, but should be doing, in your opinion.

All comments must be according to the statues that I have outlined rather briefly above, and may I remind readers that those who have the *1987–89 IUPAC Handbook* will find all the statutes and bylaws on pages 223–235 and the current programmes on pages 135–204.

Please write to: The Secretary General, IUPAC Secretariat, 2–3 Pound Way, Bank Court Chambers, Cowley Centre, Oxford, OX4 3YF, UK, as soon as possible and preferably by mid-April.

Column labelling for the long form of the Periodic Table

Daryle H. Busch

Daryle Busch, Chairman of the Commission on the Nomenclature of Inorganic Chemistry (CNIC) explains why the 1–18 scheme for labelling the Periodic Table will be used in the 1989 edition of IUPAC's *Nomenclature of Inorganic Chemistry* (Red Book).

During the past several years, the Commission on the Nomenclature of Inorganic Chemistry, CNIC, has written what will soon become the 1989 version of the manual on inorganic chemical nomenclature. The volume must contain a Periodic Table and CNIC has chosen the 18-column format, the so-called 'long form'. This choice was made because this format is, overwhelmingly, the one most used throughout the world. It is recognized that use will always be made of the eight-column table, especially in the lands of its

Table I. Eight-column short form of the Periodic Table.

I		II		III		IV		V		VI		VII		VIII	O
A	B	A	B	A	B	A	B	A	B	A	B	A	B		
1 H															2 He
3 Li		4 Be		5 B		6 C		7 N		8 O		9 F			10 Ne
11 Na		12 Mg		13 Al		14 Si		15 P		16 S		17 Cl			18 Ar
19 K		20 Ca		21 Sc		22 Ti		23 V		24 Cr		25 Mn			
	24 Cu		30 Zn		31 Ga		32 Ge		33 As		34 Se		35 Br	26 Fe	27 Co	28 Ni	36 Kr
37 Rb		38 Sr		39 Y		40 Zr		41 Nb		42 Mo		43 Tc			
	47 Ag		48 Cd		49 In		50 Sn		51 Sb		52 Te		53 I	44 Ru	45 Rh	46 Pd	54 Xe
55 Cs		56 Ba		57 La*		72 Hf		73 Ta		74 W		75 Re			
	79 Au		80 Hg		81 Tl		82 Pb		83 Bl		84 Po		85 At	76 Os	77 Ir	78 Pt	86 Rn
87 Fr		88 Ra		89 Ac**											

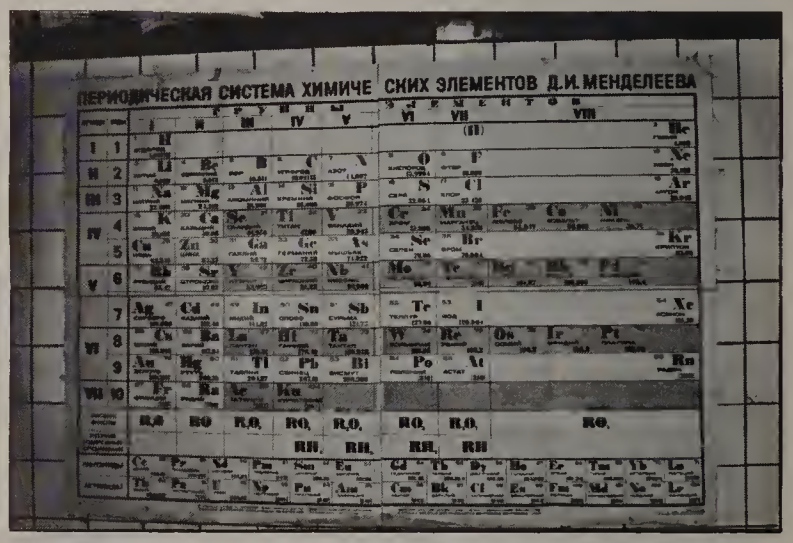
*Including lanthanoids.
**Including actinoids.

origin, and this is not discouraged. In fact, CNIC does not disparage the use of any alternate forms of the Periodic Table.

Further, CNIC will label the columns of the long Periodic Table with the arabic numerals 1 to 18. That labelling scheme has long been in use in Sweden and, to a lesser extent, elsewhere. The 1–18 labelling scheme was chosen to replace conflicting use of more familiar labels.[1–4]

In 1970, CNIC and IUPAC endorsed a system for column labelling that followed early precedent for the use of the capital letters A and B to distinguish between left and right side families of elements. The recommended practice is in use in United Kingdom, Japan, and much of Europe, but sources in the United States have adhered rigidly to an almost converse use of the A and B labels. This conflicting usage of column labels in different parts of the world produces an unacceptable ambiguity when A and B subgroups are cited in scientific publications.

In view of both the existing conflict in usage and the earlier failure of IUPAC to persuade all parties to use one of the competing AB conventions, it has been concluded that a different labelling system is badly needed. The recommendation to use the column labels 1–18 first evolved at the CNIC meeting in Paris in 1982. The judgement of CNIC, whose membership changes from year to year, has been reaffirmed, after repeated discussions, each year up to and including the present.



An eight-column Periodic Table at the Institute of Chemical Physics, Moscow: "It is recognized that use will always be made of the eight-column table, especially in the lands of its origin, and this is not discouraged".

During the years following the decision on the long form column labelling, extensive efforts were made to

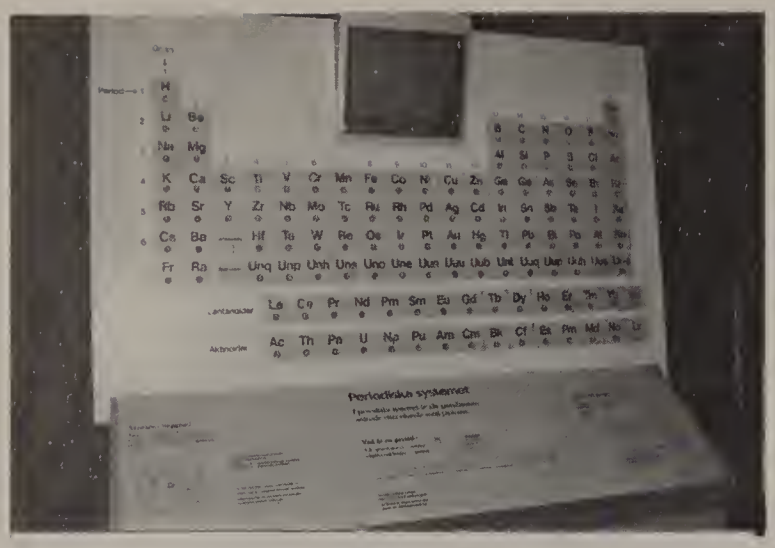
Table II. Eighteen-column numbering in a conventional long form Periodic Table.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	IUPAC 1989
IA	IIA	IIIA	IVA	VA	VIA	VIIA		VIIIA		IB	IIB	IIIB	IVB	VB	VIB	VIIB	VIIIB	IUPAC 1970
IA	IIA	IIIB	IVB	VB	VIB	VIIB		VIIIB		IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIIIA	Deming 1923
1 H																	2 He	
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne	
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar	
19 K	20 Ca	21 Se	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr	
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mn	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe	
55 Cs	56 Ba	57 71 La-Lu†	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn	
87 Fr	88 Ra	89 103 Ac-Lr‡																

		57 †La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu		
		89 ‡Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr		

Table III. 32-column form for the Periodic Table

1	2																	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	IUPAC 1989
IA	IIA																	IIIA	IVA	VA	VIA	VIIA		VIIIA		IB	IIB	IIIB	IVB	VB	VIB	VIIB	VIIIB	IUPAC 1970
IA	IIA																	IIIB	IVB	VB	VIB	VIIB		VIIIB		IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIIIA	Deming 1923
1 H																																	2 He	
3 Li	4 Be																											5 B	6 C	7 N	8 O	9 F	10 Ne	
11 Na	12 Mg																											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar	
19 K	20 Ca																	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr	
37 Rb	38 Sr																	39 Y	40 Zr	41 Nb	42 Mo	43 Te	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Ke	
55 Cs	56 Ba	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb			71 Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn	
87 Fr	88 Ra	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No			103 Lr																



The Periodic Table display at The Swedish National Museum of Science and Technology, Stockholm. The 1–18 labelling scheme has long been in use in Sweden.

communicate the recommendation to the vast and varied user public. For the first few years response was very slight but as the manual on the *Nomenclature of Inorganic Chemistry* neared completion, a great deal of correspondence began to appear on the subject, both in journals and through private channels. In addition to some supportive statements, much criticism and many complaints were presented. A large number of alternative systems has appeared[1–4].

Rather than attempting to reply here to the several issues that have arisen, it is more appropriate to indicate the general position taken and course of action proposed by IUPAC. It is neither the intent nor the purpose of the IUPAC Commission on the Nomenclature of Inoganic Chemistry to arbitrarily set the format of the Periodic Table to be use in all parts of the world; however, it is the responsibility of the Commission to offer broadly useful nomenclature proposals where direct conflict in usage occurs. Further, the book *Nomenclature of Inorganic Chemistry* 1989 must be published without delay and it can only contain material that reflects the best judgement of CNIC at this moment. With regard to the labelling of the long form of the Periodic Table, the 1–18 scheme must be used. There remains, however, a long-term decision to be made on the same matter.

The Commission on the Nomenclature of Inorganic Chemistry has decided, and the officers of the Inorganic Division of IUPAC concur, that over whatever length of time is required by appropriate and effective process, any ultimate recommendations on the format and the family labelling of the Periodic Table must be responsive to the broadest possible constituency. Each group of this large population is invited and urged to seek and present its local concensus to IUPAC and the Commission on the Nomenclature of Inorganic Chemistry, Commission II.2.

This commitment will appear in the book in the form of an appendix that has been prepared just for that purpose. That appendix will also display the most commonly published formats of the Periodic Table (see Tables) and illustrate the conflicting labelling schemes for the long form along with the scheme used in the book itself. The invitation to those various constituencies who use the Periodic Table to seek to produce and measure a concensus and communicate it to IUPAC and CNIC will also appear in the appendix. While no definite plans have yet evolved, it may be appropriate for IUPAC to generate the implied information and balloting materials.

References

1. Fernelius, W. C. & Powell, W. H., 1982. *J. Chem. Ed.*, **59**, 504.
2. Fernelius, W. C., 1986. *J. Chem. Ed.*, **63**, 263.
3. Busch, D. H., 1987. *CI*, **9**, 49.
4. Fluck, E., 1988. *PAC.*, **60**, 431.

Commission & Committee News

Toxicology wallchart

The Commission on Toxicology (VII.4) met in Brioni, Yugoslavia, 28–29 May 1988. They gave priority to a wallchart project. Preliminary drafts had been designed for cadmium, copper, lead and zinc. Information on specimen collection, processing, storage, treatment for analysis (protein precipitation, processing, direct analysis, matrix modification, digestion), instrument, digestion), instrument conditions and reference materials will be included in this project.

Commission members expressed a need for more active participation of national representatives in projects and meetings. Members were encouraged to become affiliate members of IUPAC and it was hoped that the commission would become more open to a new generation of toxicologists.

The Subcommittee on Nickel has prepared a draft

document on "Working methods for analysis of nickel in serum, whole blood tissues, urine and faeces by electrochemical atomic absorption spectrophotometry". The document will be submitted for publication in *PAC*.

The Subcommittee on Analytical Methods is conducting a pilot study on lithium and a joint project with Dr P. de Biévre (Inorganic Chemistry Division) on the application of isotope dilution mass spectrometry to assign target values for trace elements in quality assurance materials. The chairman of the subcommittee is Dr J. Savory.

The Subcommittee on Quality Assurance and Harmonization, chaired by Dr I. Thomassen, is developing sera with assigned values. The Subcommittee on Risk Assessment plans to emphasize international cooperation on the interpretation of clinical chemistry data with regard to health risks.

The commission approved two new projects on "Toxicology terminology" and "Toxic drug monitoring" for submission. It will continue to focus on nomenclature, definitions of terms, standardization, field methods and harmonization, and interpretation of analytical data.

The next meeting will be held in Helsinki, Finland, 7 September 1989 and will be open to participants at the IUPAC-sponsored meeting on nickel toxicology.

Rita Cornelis

Radiochemistry and nuclear techniques

When the Commission on Radiochemistry and Nuclear Techniques (V.7) met in Brighton, UK on 10 July 1988 they discussed a glossary on "Nomenclature for Radioanalytical Chemistry". The glossary, which had been initiated several years ago is to be extended with additional entries and definitions.

A world-wide compilation on "Sources of information on radiochemistry" has been prepared. So far, from 67 questionnaires sent out, 43 countries have sent answers. The compilation will contain training information contact addresses, technical information, details of international agencies and organizations and details of journals on radiochemistry and nuclear techniques. A first draft of this report was due by the end of 1988.

Some progress has been made on the compilation of a report on "Radiochemical techniques on biological systems". The commission also received short review papers on the following topics: positron emission tomography; proton-induced X-ray emission spectroscopy; perturbed angular γ-γ-correlation; and neutron activation analysis.

Work on "Facilities for the determination of very low level radioactivity" is also progressing. A first draft should be available at the Lund general assembly.

In a discussion about the proposed "Think tank" model for the Analytical Chemistry Division, commission members felt that a matrix structure was probably not the best way to deal with division projects. Projects should be coordinated with other divisions and commissions as appropriate.

H. R. von Gunten

Links between biotechnology and organic chemistry

The Commission on Biotechnology (VI.2) meeting held in Paris, 13–16 July 1988 was hosted by the Pasteur Institute.

The Commission on Biotechnology at their meeting at the Pasteur Institute, Paris in July 1988

The Commission discussed the revised draft of the "Glossary of terms used in biotechnology for chemists". A suggestion was made to complete it by adding some selected biochemical engineering terms and to finish the project by the end of 1988.

An extension to further projects concerning related fields is under discussion. The project draft "Selection of terms, symbols and units related to microbial processes" has been revised by a group of leading scientists and several publishers. The deadline for final comments on the project was fixed for September 1988.

A comprehensive compilation of international and national guidelines for the use of micro-organisms and other biological materials in chemical processes has been updated and prepared for publication. The growing interest and need for such publications was underlined by a discussion with invited representatives of the French pharmaceutical industry directed to problems of biological safety.

Several activities of Commission VI.2 are directed to a closer link between biotechnology and organic chemistry. Annual publications include topics such as: biotransformations as a useful tool in organic chemistry, molecular biological fundamentals of degradation of certain chemicals, and the role of biochemical engineering in biotechnology as well as articles with a more futuristic outlook to which leading scientists should be invited to contribute.

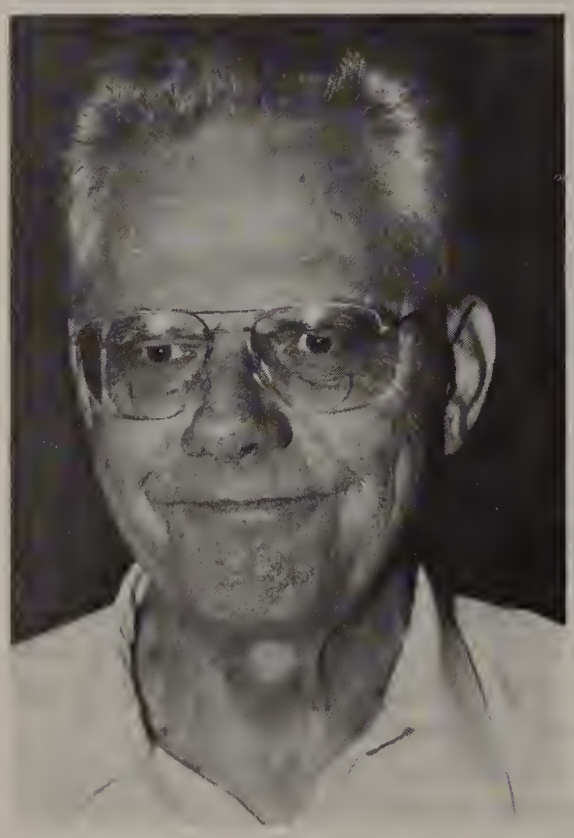
The commission decided to finalize in the summer of 1989 a questionnaire aimed at developing closer links between the pharmaceutical industry and IUPAC. The commission has also asked the Commissions on Food Chemistry (VI.1) and Fats, Oils and Derivatives (VI.3) for advice and a review of their project on "Single cell biomass with high lipid content for animal feed".

The commission emphasized the importance of projects launched by the Steering Committee on Biophysical Chemistry and supports them by encouraging scientists to take part in compiling thermodynamic data of protein stability.

The tasks of a biotechnology body in IUPAC were discussed in a broader context. The commission agreed to complete the draft of a corresponding feasibility study together with representatives of the European Federation of Biotechnology by the end of 1988 to give the IUPAC Bureau a basis for future decisions.

In a discussion with Prof. Philipp Gerhardt, President of COBIOTECH (Scientific Committee on Biotechnology of the International Council of Scientific Unions) the commission expressed its expectations and support concerning the coordination and information role of the ICSU biotechnology body.

The commission recommended to ICSU's International Committee on Economic and Applied Microbiology (ICEAM) that they consider scientific aspects of nutritional and toxicological differentiation of yeasts of genus Candida.



Prof. Philipp Gerhardt, President of ICSU's Scientific Committee on Biotechnology (COBIOTECH).

The organizing committee of the 8th International Biotechnology Symposium held in Paris 17–22 July 1988 reported on symposium arrangements. About

Dr Lucien Penasse (left), Vice-President of the Organizing Committee of the 8th International Biotechnology Symposium and French National Representative on the Commission on Biotechnology.

2400 participants were expected. The commission acknowledged efforts made for organizing a broad and interesting scientific programme supporting further progress in biotechnology.

The commission chairman, Prof. Manfred Ringpfeil proposed to contact the organizing committee of the 9th International Biotechnology Symposium to be held in Washington in 1992 and request a written report for distribution to commission members. The commission unanimously welcomed the offer of the Australian Biotechnology Association to host the 10th International Biotechnology Symposium in Sydney in 1996. However, concern was expressed that a broad attendance from the Asian region and of people from overseas should be guaranteed.

An open meeting is being arranged on 12 August 1989 during the Lund general assembly for chemists interested in biotechnology especially genetic and protein engineering, biotransformation and bioprocessing.

Bertram Nagel

Macromolecular compendium

The Commission on Macromolecular Nomenclature (IV.1) met in Tokyo, 26–30 July 1988. Over the previous 12 months, the commission had cleared several obstacles towards completion of a compendium of macromolecular terminology and nomenclature.

A principal hindrance was the need to include three recently completed reports which have yet to be published in *PAC*. Two of the reports, one dealing with definitions of terms related to dilute polymer solutions and the other with a classification scheme for polymers, were corrected at the meeting and should appear in print shortly. The third report, completed since the last meeting at the Boston general assembly, on definitions related to crystalline polymers, is expected to be published following a short procedural delay.

In other work, the commission has agreed upon the basic structure-based nomenclature rules for identifying and orienting constitutional repeating units in ladder polymers. Further, to better indicate the ladder-like nature of the macromolecule, the commission agreed to use the term "tetrayl" to denote the four sites of attachment to the constitutional repeating unit.

The unambiguous graphic representation of copolymer structure has often been difficult for the polymer chemist. The commission, to remove the ambiguity, has agreed upon basic rules for formulae representing both end-groups and the multiplicity of constitutional units of copolymers.

In two other projects, one to develop the terminology for static and dynamic properties in the bulk state and the other to define the terminology for liquid crystalline polymers, the commission decided to increase the scope of the work. The former will be expanded to include non-linear viscoelasticity and, possibly, a section on molecular theory of mechanical behaviour. The latter will include, besides polymers, low molar mass liquids crystals.

New drafts of documents dealing with source-based naming of cross-linked polymers, networks, other non-linear polymers, and blends; classification of polymerization reactions by their mechanism and stoichiometry; terminology for reactions leading to chiral macromolecules; and structure-based nomenclature for irregular polymers were received by the commission.

The initial steps towards a revision of the commission's 1974 document "Basic definitions of terms relating to polymers" have been established.

W. J. Work

Contents of "Red Book II" defined

At the Commission on Nomenclature of Inorganic Chemistry (II.2) meeting in Helsinki, Finland, 1–6 August 1988, a short time was devoted to business related to Red Book Part I. Instructions were given to editor G. J. Leigh on some minor matters related to presentation. Publication was already announced by Blackwell Scientific Publications and the date of publication was expected to be in the early months of 1989, a short time behind the previously announced date.

Decisions were taken to define the contents of Red Book Part II. A number of documents were examined and the following were finally retained, each document to be revised and updated in order to constitute a separate chapter:

1. Isotopically modified compounds. This chapter is to incorporate the IUPAC document "Names for hydrogen atoms, ions or groups".
2. Nomenclature of nitrogen hydrides.
3. Nomenclature of regular single-strand and quasi single-strand inorganic and coordination polymers.
4. Nomenclature of polyanions.
5. Nomenclature of inorganic chain and ring compounds.

Documents 1 to 4 are IUPAC publications which appeared at the various dates of their completion by the commission. Document 3 was produced jointly with the Commission on Macromolecular Nomenclature (IV.2). Document 5 was approved in its final version at this meeting and is now following the usual procedure as an IUPAC publication. Other documents under preparation by the commission and which will also be included are:

6. Ligand abbreviations.
7. Nodal nomenclature for fused ring and branched chain compounds.

Finally, other documents such as "Nomenclature of tetrapyrrole metal complexes and cobalamine" emanating from other IUPAC commissions or organizations were considered also appropriate to be included after revision and updating with permission and collaboration of the parties concerned.

Prof. J. McCleverty was appointed by the commission as editor. As a reminder, Part II deals with inorganic nomenclature in specialized areas of chemistry.

Most of the meeting was dedicated to business within working parties on new projects which were laid down in the past and on which only preliminary reports were produced so far. Thus the greastest subject of concern was related to coordination-based systematic nomenclature of group 14 compounds. In this context, revision of Section D of *Nomenclature of organic chemistry* was considered timely and a joint effort with the Commission on Nomenclature of Organic Chemistry (III.1) was proposed.

Other projects which are progressively maturing are: clusters ranging from boron compounds to transition metal derivatives and the search for a systematic method or numbering; nodal nomenclature applied to inorganic rings and chains; and organometallic isomers (for instance in diene complexes). Each topic was assigned to a working party and contribution of specialists from outside the commission will also be solicited.

A newsletter for 1989 is in preparation.

Finally, the commission was asked to produce an

extended definition of the term "ligand" to cover areas other than inorganic chemistry, but this was not found to be a vital problem so as to justify modification of the already approved definition.

E. Samuel

Stability constants' database

When the Commission on Equilibrium Data (V.6) met in Porto, Portugal on 30 August 1988, it considered the following major topics:

- The role of the commission in a restructured Division of Analytical Chemistry.
- The critical evaluation of equilibrium data, including values measured under special conditions (for example, in sea water or molten salts).
- The best way in which to collect and distribute the wealth of stability constant data in the literature.

In connection with the first topic the members questioned whether the commission was analytical. They agreed that the present work of the commission was different in form and emphasis from that of many other commissions in the division: for example, it is neither method nor problem-orientated.

Some aspects of the commission's work could be accommodated under one or other of these general headings but the major topics of data collection and critical evaluation may be best separated into either another division or become interdivisional topics. A subcommittee was set up to study the problem.

Suggestions welcome

Many critical evaluations of stability constants have already been published in *PAC* and reports or drafts covering all remaining biologically important amino acids and complexes in molten salts were received at the meeting.

Suggestions for systems for which a critical evaluation would be useful (and for which there are sufficient data in the literature for such an evaluation) are welcomed by the commissions, especially if suitably qualified evaluaters can be suggested at the same time.

Volunteers needed to help with database

A stability constants' database is presently being prepared with the intention of producing a hard copy supplement to the existing compilations already produced by the commission and IUPAC. However, the long-term aim is to make the entire database available through micro-computers to allow users to selectively inspect, examine and sort the data.

This is a major task. A computer program for use on any IBM micro or compatible was available at the meeting for use by data collectors. The program provides a "friendly" environment for data entry, inspection and editing and produces text files which are directly compatible with the data management program which has been prepared in Stockholm. Hence disks prepared locally on any IBM micro (or compatible) can be read directly into the main database in Stockholm.

Volunteers are now being sought to assist in entering data into the database through any IBM compatible micro. International data collectors have already abstracted data from many journals onto data sheets so two varieties of help are required:

- Those willing to search remaining journals for stability constant data and, if possible, enter the data into a micro-computer.
- Those willing to help in transferring data from sheets into a micro, and checking the stored data.

If anyone can help please contact: Dr L. D. Pettit, School of Chemistry, University of Leeds, Leeds LS2 9JT, UK. Tel: +44 (532) 336403. Telex: 556473.

Leslie D. Pettit

The Commission on Equilibrium Data in Porto, Portugal.

Procedure for comment and approval of IUPAC recommendations on nomenclature and symbols

In 1984 IUPAC introduced, on a trial basis, and in 1987 confirmed, a new system which avoids the double publication of recommendations (in provisional and then revised form) in *Pure and Applied Chemistry (PAC)*, but still provides an opportunity for world-wide comment on the provision proposals:

1. Provisional recommendations by a commission are submitted to the secretariat via, and with the approval of, the commission chairman and the division president (see Figure 1). There should normally have been taken into account comments from about 15 experts on the subject matter of the document, including about three manuscripts editors of journals that publish substantial numbers of papers in the relevant field of chemistry. The names and addresses of the experts and/or editors that have been consulted must be submitted with the provisional recommendations; titular or associate members of the commission in question should only be included on the list if they have specific expertise in the subject.
2. The provisional recommendations sent to the Secretariat must include:
   (a) a 200-word synopsis;
   (b) the name and address of the commission member acting as document editor to whom comments should be sent;
   (c) the name of the commission member who will eventually prepare camera-ready copy for publication in *PAC*.
3. The provisional recommendations are sent from the Secretariat to the members of the Interdivisional Committee on Nomenclature and Symbols (IDCNS) for approval. The names and addresses or the experts and/or editors consulted by the relevant commissions (see 1 above) are also sent to the IDCNS officers to ensure that they do not approach the same persons (see 4).
4. The IDCNS chairman, or by designation the secretary, on suggestions from members of IDCNS and/or if he considers it to be desirable, may send the provisional recommendations to further experts and/or editors whose names and addresses are supplied to him. The IDCNS chairman or secretary will also signify his approval, or otherwise, of the synopsis and of public distribution of the provisional recommendations.

Prof. O. Achmatowicz Jr. (left) and Dr. J. Kahovec (right) who are responsible for the national centres in Poland and Czechoslovakia respectively.

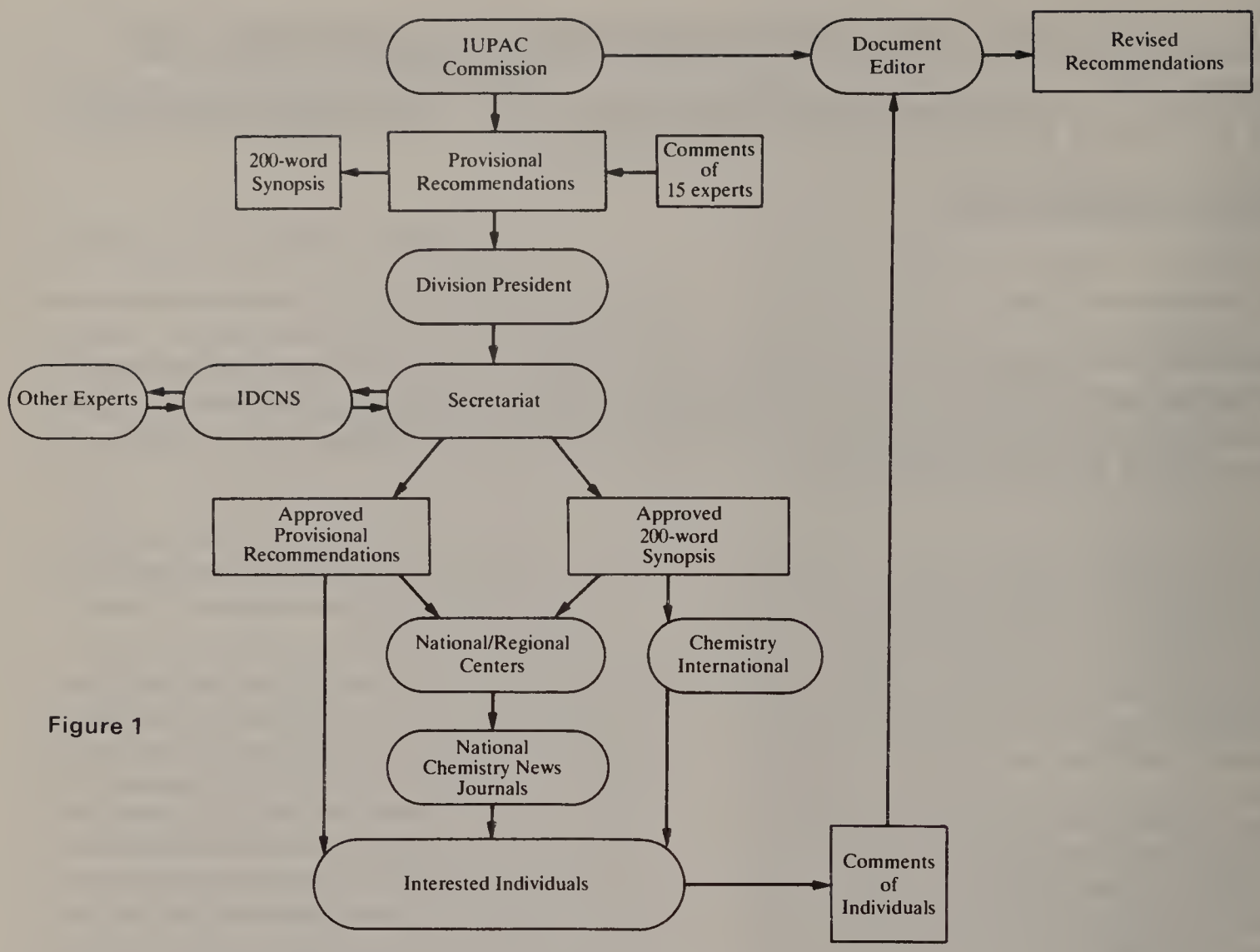


Figure 1

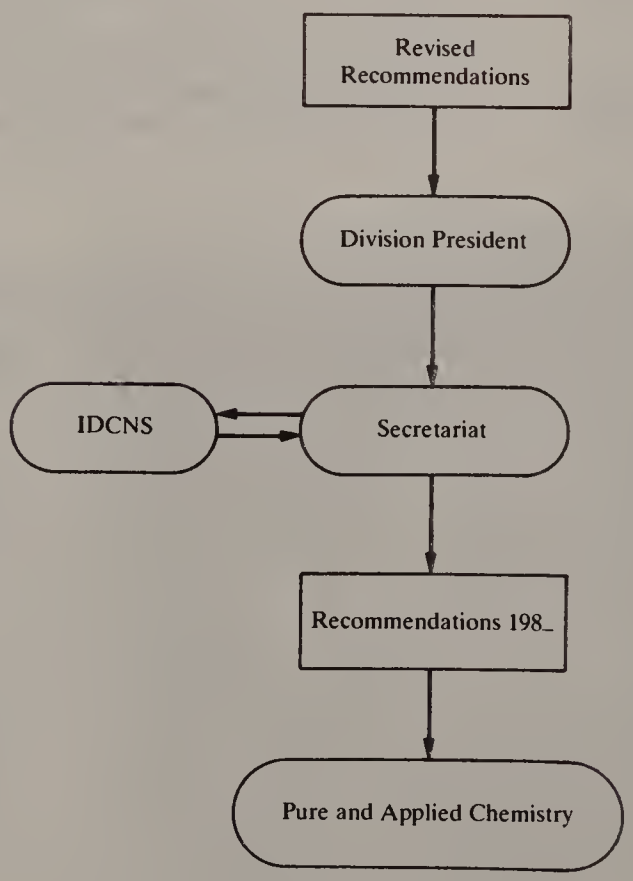


Figure 2

Addresses of National Regional Centres

If you would like to comment on provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the Secretariat. The most up-to-date list of national/regional centres is shown below.

Argentina

Dr J. Mazar-Barnett,
Asociación Química Argentina,
Sánchez de Bustamente 1749,
Buenos Aires,
Argentina.

Asia (Australia, Bangladesh, Hong Kong, Indonesia, Iraq, Korea, Malaysia, Nepal, Philippines, Singapore, Sri Lanka, Thailand)

Professor Sang up Choi,
c/o Korean Chemical Society,
35 5-KA Anam-Dong,
Sungbuk-Ku,
Seoul 136-075,
Korea.

Bulgaria

Professor O. Peshev,
Bulgarian Academy of Sciences,
Centre for Chemistry,
Academician G. Bonchev Street,
Bulding 11, 1040 Sofia,
Bulgaria

Canada

Professor J. ApSimon,
Department of Chemistry,
Carleton University,
Ottawa, Ontario K1S 5B6,
Canada.

China/Beijing

Professor Cui Meng-Yuan,
Chinese Chemical Society,
POB 2709,
Beijing,
China.

China/Taiwan

Professor F. C. Chen
Department of Chemistry,
National Taiwan University,
POB 30-373,
Taipei 107,
Taiwan.

Czechoslovakia

Dr J. Kahovec,
Ustav Makromolekulárni Chemie,
Ceskoslovenská Akademie Ved,
Heyrovského nám 2,
CS-162 06 Praha 6,
Czechoslovakia.

France

Professor Y. Jeannin,
Comité National de la Chimie,
28 rue Saint-Dominique,
F-75007 Paris,
France.

Federal Republic of Germany

Professor H. Grünewald,
c/o Verlag Chemie, GmbH,
Postfach 1260/1280,
Pappelallee 3,
D-6940 Weinheim,
Federal Republic of Germany.

German Democratic Republic

Professor H. Schick,
Chemische Gessellschaft der DDR,
Nationales Zentrum für IUPAC Nomenklatur und Symbole,
Clara-Zetkin-Strasse 105, PF 1327,
1086 Berlin, GDR.

Hungary

Professor E. Pungor,
Altalános és Analitikai Kémiai Tanszék.
Budapesti Müszaki Egyestem,
Gellért tér 4,
H-1521 Budapest X1,
Hungary.

India

Dr V. C. Vora,
Indian National Science Academy,
Bahadur Shah Zafar marg,
New Delhi 110002,
India.

Italy

Professor F. Rallo,
c/o Societá Chimica Italiana,
48 Via le Liegi,
1-00198 Roma,
Italy.

Japan

Dr H. Hamada,
Executive Director,
Chemical Society of Japan,
1-5 Kanda Surugadai,
Chiyoda-ku,
Tokyo 101,
Japan.

Netherlands

Ir. E. J. de Ryck van der Gracht,
Koninklijke Nederlandse Chemische Vereniging,
Postbus 90613,
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5. The synopsis, if approved, is sent from the Secretariat, with a note that a copy of the provisional recommendations may be obtained *only* for comment from various national/regional centres, for publication in:

   (a) *Chemistry International* (*CI*) and *PAC*;
   (b) national chemistry news journals via certain national/regional centres.

   National/regional centres also receive the list of experts consulted by the originating commission.

6. All those who are sent, or send for, a copy of the provisional recommendations are asked to return their comments to the document editor within eight months of publication of the synopsis in *CI*.
7. Not less than eight months after publication of the synopsis, the provisional recommendations are revised, as necessary, by the commission to take into account comments received.
8. The revised recommendations are resubmitted to the Secretariat, via the commission chairman and division president, for final approval by IDCNS, normally within eight weeks (see Figure 2).
9. The revised recommendations, with their date (year) of adoption, are published in *PAC*.
10. Publication of the revised recommendations is announced in *CI*.

Copies of provisional recommendations may be obtained from the national/regional centre nearest to you (see below) or in case of difficulty from: Dr A. D. McNaught, Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge CB4 4WF, UK. Copies cannot be obtained from the IUPAC Secretariat.

Republication/translation of IUPAC commission reports

Reproduction or translation of IUPAC recommendations on nomenclature and symbols and other technical reports of commission published in *PAC* is encouraged, provided that it is accompanied by a reference to the original publication in *PAC*. Translation into another language is subject to the additional condition of prior approval from the relevant national adhering organization of IUPAC.

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these published in *CI* as recent reports.

Glossary of atmospheric chemistry terms

The *Glossary* contains definitions of over 600 scientific terms in common use in atmospheric chemistry. The diversified nature of the scientists involved in research in atmospheric chemistry, chemists, meteorologists, physicits, biologists, engineers, health scientists, and others, points to the very special need for a definition of the common terms employed by each specialist. The *Glossary* was prepared to provide unambiguous definitions of terms and units employed by the international research community in atmospheric chemistry to help achieve reliable communications between all parties. Where alternative terms are in common use to describe a given process, piece of equipment, feature, or quantity used in atmospheric chemistry, recommended choices are given. The range of terms includes those encountered in describing the properties and composition of the atmosphere, clouds, solar radiation, chemical and physical changes in atmospheric components, instrumentation employed in analysis of the atmospheric components and in air quality control, and in effects of certain trace gases on materials, plants, and animals.

Comments on the glossary should be sent by 31 October 1989 to the Chairman of the Commission on Atmospheric Chemistry: Prof. J. G. Calvert, National Center for Atmospheric Research, Atmospheric Chemistry and Aeronomic Division, POB 3000, Boulder, Colorado 80307-3000, USA.

Terminology in semiconductor electrochemistry and photoelectrochemical energy conversion

In the document recommendations for the usage of symbols and terminology in semiconductor electrochemistry are given. Such a supplement to conventional electrochemical usage is necessary because of the additional terminology based on solid state

physics and chemistry. Since different symbols are conventionally used in electrochemistry and semiconductor physics for the same quantities, one has had to compromise with symbols in the present document which differ from those originally recommended by the Commission of Electrochemistry. In the present document energy levels in the bulk of the solid and the electrolyte including their interface are introduced and kinetic parameters defined. In addition a terminology on photoelectrochemical cells is recommeded. In the latter case it is distinguished between two modes of operation in these cells, i.e. photovoltaic cells in which radiant energy is converted into electrical energy and photoelectrolysis cells in which radiant chemistry causes a net chemical conversion.

Comments on the glossary should be sent by 31 October 1989 to: R. Memming, Institüt Solarenergieforschung GmbH, 3000 Hannover 1, Sokelantstr. 5, FRG.

Publications

The determination of trace metals in natural waters

Introduction

Each field of chemistry is confronted with the problem of monitoring of water quality and research on trace chemical compounds. Obtaining perfectly pure water is a major problem; the chemistry of solutions and the laws and mechanisms of reactions were for a long time limited to aqueous solutions before non-aqueous solvents were developed. But water is also intimately linked to life — it is even the *sine qua non* of life — and has a considerable biological and socio-economic importance, which makes the protection and treatment and, therefore, the quality control, of natural waters a matter of great general interest on a global scale.

Water analysis gives rise to a variety of tasks calling for the most modern means of production and the most modern means of production and the most elaborate analytical techniques which benefit daily and immediately from scientific and methodological advances. Amongst the many problems to be solved, that of research on trace metals arises every day and has many aspects, all of which call for the same types of analytical methods.

Water is intimately linked to life — it is even the *sine qua non* of life — and has a considerable biological and socio-economic importance, which makes the protection and treatment and, therefore, the quality control, of natural waters a matter of great general interest on a global scale.

'Waters circulating on the surface of the globe or in oceans polluted by biological and industrial wastes must undergo considerable purification, which implies the determination of trace concentrations at nanogram or picogram levels; such levels are, nevertheless, sometimes capable of modifying biological equilibria, ecosystems and our environment irreversibly.'

Underground waters that are well protected from pollution nevertheless include inorganic trace elements that are much sought after for their curative properties, but the consumption of such waters is prohibited because of the risks of poisoning. Waters circulating on the surface of the globe or in oceans polluted by biological and industrial wastes must undergo considerable purification, which implies the

determination of trace concentrations at nanogram or picogram levels; such levels are, nevertheless, sometimes capable of modifying biological equilibria, ecosystems and our environment irreversibly.

Trace elements intervene in biological processes and enzyme reactions, enhancing or inhibiting them. In everyday life, drinking water itself is subject to a particularly careful and continuous analysis, in view of the many risks of pollution. Trace metals dumped in metallic or plastic containers can contaminate or pollute foodstuffs; also, in the field of therapeutics, traces of aluminium in water used for haemodialysis can cause brain disorders.

Important contribution of Analytical Chemistry Division

Whatever the specialization of scientists working on the determination of trace elements in natural waters, the collaboration of the analytical chemist is indispensable to provide the best suited methods from the various branches of analytical chemistry, and it is for this reason that the Division of Analytical Chemistry of IUPAC makes a particularly important contribution. In effect, the various commissions of the division address all aspects of modern analytical chemistry. The division promotes chemical and instrumental methods of analysis (spectral, electrochemical, chromatographic). Its Commissions on Microchemical Techniques and Trace Analysis (V.2) and on Radiochemistry and Nuclear Techniques (V.7) undertake the development of trace analysis.

The recording, analysis and interpretation of data are the object of the work of other specialized commissions. The division and its commissions thus have a research and analysis potential that can be, and is, applied to the detection of trace metals in natural waters.

This project, initiated in 1979 by T. S. West, president of the division, involves the participation of most of the commissions of the division and is intended to offer chemists and related scientists a survey of available methods, showing their respective performances, their areas of application and, in general, information that will enable them to apply the data to the resolution of specific problems. In the field of the determination of trace metals in natural waters, the work to be covered was enormous and it was necessary to organize the method of work.

This book is dedicated to Professor Wolfgang Nürnberg who died suddenly in May 1985. From the start of the project, Professor Nürnberg showed great enthusiasm for coordinating the commissions' work, linking the reports, harmonizing the format. At the same time he brought us his internationally renowned competence in the field of the determination of traces

On the left: Prof. Jacques Robin (member of Analytical Chemistry Division Committee, 1983–87) who contributed a chapter on "Analysis of water by emission spectrometry with an inductively-coupled plasma source". Centre: Secretary General Prof. Tom West who, with the late Prof. Wolfgang Nürnberg, edited *The determination of trace metals in natural waters*. Right: Prof. Duncan Thorburn Burns (Chairman of the Commission on Analytical Reactions, Reagents, and Separations) who contributed a chapter on "Spectrophotometric and fluorimetric determination of selenium."

of elements as well as the experience of his own research work.

The work was carried out in two stages. The first stage consisted, in commissions making an inventory of methods, giving their performances, precisions, sensitivities and limits, the possibilities for development and the types of application; in other words, the objective of this inventory was to guide the user in his choice of method. The outputs of the commissions were compiled by the co-ordinator. It was clear from the outset that it would constitute a major work.

The specialists in each commission, selected the methods best suited to the analysis of natural waters on the basis of their personal experience. The choice of methods was not limited to the most sophisticated or those of highest performance; in many countries or in particular circumstances it might be necessary to have a simple analytical set-up.

Finally, the work as a whole is based on the expertise of all the members of the Division of Analytical Chemistry who, since 1979, in the various commissions, have taken part in its preparation and have made an effort for which they should be thanked.

We hope that this manual will meet the needs of the many potential users for reliable guidelines and methods for the analysis of trace elements in natural waters, e.g. analytical chemists, hydrologists, oceanographers, toxicologists, ecologists, etc. involved in the quality control of natural waters and the detection of traces.

The role of the Division of Analytical Chemistry of IUPAC is to provide a clear picture based on an objective well-informed choice of available methods. This book on trace analysis in water, required analytical chemists not only for the analysis, but also for guidance in the choice of methods. We hope that it will render a service to analytical chemists in the solution of their specific problems and stimulate them to undertake and develop new research.

F. Pellerin

Sampling for analysis

The idea of this book on the determination of 10 biosignificant trace metals in natural waters was evolved by the Analytical Chemistry Division several years ago. It rapidly became a 'whole division' project involving chemists from many countries although the authors of the present 10 sections are necessarily limited in number. Professor Pellerin, president of the division from 1981–85, has set out the *raison d'être* of the book in his introduction above and no further comment is, therefore, required.

The work was planned to conclude and be presented at the 1985 general assembly of IUPAC under the joint editorship of Prof. H. W. Nürnberg, and the writer, with the objective of publication in early 1986, but the untimely death of Prof. Nürnberg in spring 1985 and other circumstances subsequently made this target impossible.

Analysis depends critically on the acquisition of a sample that is truly representative of the material to be analysed. At first sight it might appear that few things would be easier to sample than water, but even this is fraught with difficulties. In addition, at the trace element level, there are serious problems that arise from significant contamination during sampling and storage due to the presence of extraneous materials, including the sampling device and the storage vessel and, equally, a serious risk of loss of analyte due to adsorption, vaporisation, biological, chemical and other physical changes.

However, sampling is a problem that is common to all the trace element procedures whether they be electroanalytical, radiochemical, spectrochemical, etc. For this reason sampling techniques are dealt with in detail in Section 3 only, although the essential principles of sampling, storage and transportation are mentioned very briefly in the introduction to Section 2.

Section 1 on spectrophotometric methods is given at the level of practical detail as in a laboratory manual, since such methods are likely to be applicable in most laboratories and for this reason the section is arranged element by element and on an individual author basis. The material in this chapter was co-ordinated on behalf of the members of Commission on Analytical Reactions and Reagents (V.1) by the secretary of Division V, G. den Boef with the help of A. Hulanicki and D. T. Burns.

Following this, spectrochemical methods such as atomic absorption spectrometry, which is also generally available and widely used is discussed in Section 2 along with other more specialized techniques of spectrometry.

Section 3, apart from dealing with sampling techniques for trace metals in sea water, flowing streams, sedimented waters, etc., discusses electrochemical techniques in a fair degree of detail and partly on an individual element basis because electrochemical techniques are also widely available. Section 4 is on general aspects of trace metal analysis by neutron activation methods, but in much less detail and not on an individual element basis. Section 5 deals with pH measurement in natural waters — a considerable problem, but one of fundamental importance.

Speciation in general, which is of profound importance for the chemical, biological and even physical reactivity of trace metals is discussed in considerable detail in the next five chapters, namely: Electrochemical measurement of speciation (6), complexation by inorganic ligands in sea water (7), complexation by suspended particulate matter (8), speciation in oxygenated estuarine waters (9), chemical mechanisms in sea water (10).

The trace metals whose analyses are discussed in this book are those of principal biosignificance either from the viewpoint of their essentiality to various life-

Section 5 deals with pH measurement in natural waters — a considerable problem, but one of fundamental importance.

forms or of their toxicity, namely

Cd, Co, Cu, Hg, Mo, Ni, Pb, Se, Zn.

It is appreciated that there are, of course, many other biosignificant trace elements and indeed some of them are also referred to, e.g. Fe, Mn and V, in the texts of the various sections.

T. S. West

The determination of trace metals in natural waters *edited by T. S. West and the late H. W. Nürnberg is published by Blackwell Scientific Publications Ltd, Oxford, UK, 1988. xviii + 362 pp. ISBN 0-632-02021-0. Price GBP 60.00/USD 85.00. Affiliate Discount Price GBP 45.00/USD 64.00.*

Scales and global changes

The global environment is being significantly affected by human activity. Changes in vegetation cover will affect the global hydrological cycle, production of 'greenhouse gases' will lead to climate changes, changes in atmospheric chemistry can have effects on terrestrial and freshwater ecosystems, and man-made chemicals decrease the Antarctic ozone layer. In order to address these global issues in a scientifically meaningful way, a new earth system science is needed, which takes a truly multi-disciplinary approach.

However, when linking observations from different spatial and temporal scales, fundamental problems are encountered. If ICSU's International Geosphere-Biosphere Programme: A Study of Global Change is to be successful, scale problems have to be faced and new approaches developed.

ICSU is the International Council of Scientific Unions. One of its committee is the Scientific Committee on Problems of the Environment. SCOPE Report 35 is the first book to address scaling problems both within individual disciplines and between disciplines, and represents an important first step in developing strategies for global change studies. The book has the title *Scales and global change: Spatial and temporal variability in biospheric and geospheric processes.*

SCOPE 35 *is edited by Thomas Rosswall, Robert G. Woodmansee and Paul G. Risser and published by John Wiley & Sons, Chichester, UK, 1988. xvii + 355 pp. ISBN 0-471-91828-8. Price GBP 50.00/USD 100.00*

Acidification in tropical countries

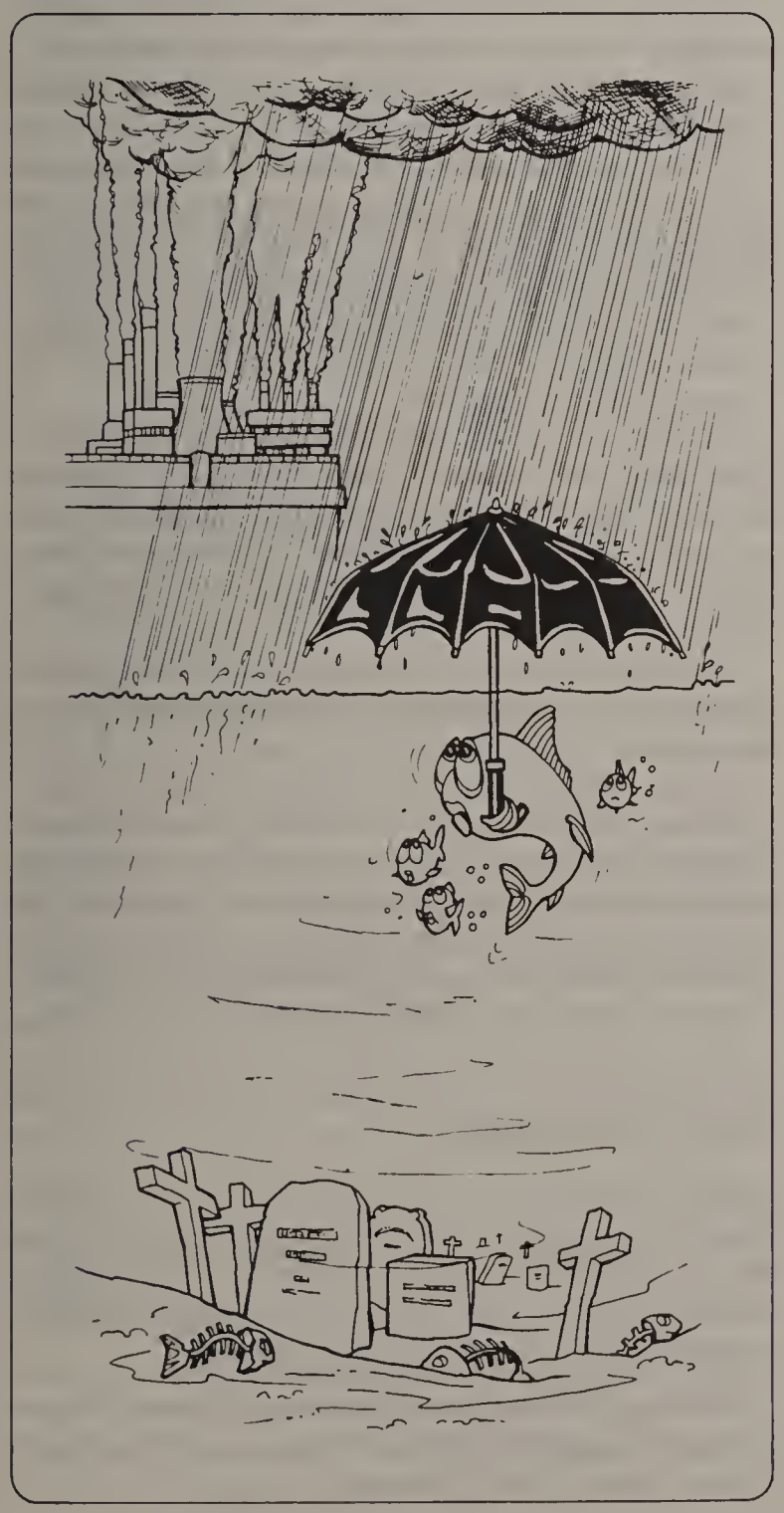
Emissions of sulfur and nitrogen oxides into the atmosphere in Europe and North America have resulted in widespread environmental effects, including acidification of soils, surface and groundwaters, injury to vegetation, corrosion of building materials and decreased atmospheric visibility. Although there is still considerable uncertainty regarding some of the cause and effect relations, for example, in connection with injury to forests, many environmental effects are well documented.

There are very good reasons to consider acidification as one of the most serious environmental problems facing industrialized countries today. A natural question to ask is whether acidification is also a serious problem in other parts of the world. Even if this is not the case, it is important to know what the prospects are for the future: how susceptible are tropical ecosystems, for example, to future emissions of sulfur and nitrogen pollutants?

Workers open a ditch to irrigate a potato field in the San Francisco River Basin, Brazil. Brazil was one of the countries participating in the SCOPE project to examine the effects of sulfur and nitrogen oxides emissions on the environment — including acidification of soils, surface — and groundwaters and injury to vegetation. (*UN photo issued by FAO*).

In 1984, the Executive Committee of the Scientific Committee on Problems of the Environment (SCOPE) — one of the scientific committees of the International Council of Scientific Unions (ICSU) — decided to launch a project to answer some of these questions. Case studies were initiated in late 1984 to describe the current situation in relation to acidification and other regional air pollution problems in seven countries: Australia, Bangladesh, Brazil, China, India, Nigeria and Venezuela. The case studies were presented at a workshop held in Caracas, Venezuela in April 1986. In addition, several background papers were prepared by scientists experienced with acidification problems in Europe and North America.

During the year following the Caracas workshop the case study reports were reviewed, expanded and improved. Unfortunately, for reasons outside the control of the project, two of the case studies (Bangladesh and India) were never completed.



The case studies from Australia, Brazil, China, Nigeria and Venezuela are published in *SCOPE Report 36: Acidification in Tropical Countries*. The book also contains five background chapters and a synthesis chapter which summarizes the most important findings of the project.

The contributions in this book reflect our current understanding of the potential for acidification in five countries. The data used in this assessment are generally sparse and thus may not be representative of all parts of the tropics. The book should therefore not be regarded as a final assessment. It is rather a beginning that needs to be completed by much additional data.

SCOPE Report 36: Acidification in Tropical Countries *is edited by Henning Rodhe and Rafael Herrera and published by John Wiley & Sons, Chichester, UK, 1988. xviii + 405 pp. ISBN 0 471 91870 9. Price GBP 65.00/USD 143.00.*

Thermodynamic properties of ethylene

With the growth of the petrochemical industry, worldwide production of ethylene expanded rapidly into the megatonne per year range. Since ethylene is easily transported by pipeline, by the 1960's there were extensive networks of pipelines carrying ethylene from producers to users. With this growth came a need for an agreed set of reference data for process and plant design and for custody transfer.

THE DETERMINATION OF TRACE METALS IN NATURAL WATERS
Chemistry of Oxide Superconductors
COMPENDIUM OF ANALYTICAL NOMENCLATURE
Compendium of Chemical Terminology
Quantities, Units and Symbols in Physical Chemistry

Some recent IUPAC titles published by Blackwell Scientific Publications.

In 1968, the IUPAC Sub-Committee on Thermodynamic Tables approved the setting up of a task group on ethylene. It concluded that the various tables used in industry were in conflict, contained unjustifiable extrapolations and were not thermodynamically self-consistent. A collaborative effort to produce new tables culminated in 1972 in the publication of the first IUPAC monograph on ethylene. However, this volume has been made obsolete by the large amount of experimental data which has been published since then. The 1988 volume on ethylene takes account of all the new data and thus replaces the 1972 edition.

The new volume, entitled *Ethylene (Ethene),* is volume 34 of *IUPAC Chemical Data Series* and volume 10 of the series of *International Thermodynamic Tables of the Fluid State.* The latter series was inaugurated in 1963 by the Commission on Thermodynamics and Thermochemistry of IUPAC's Physical Chemistry Division with the object of compiling internationally agreed values of the equilibrium thermodynamic properties of liquids and gases of interest to both scientists and technologists.

Thermodynamic consistency between the various properties which are given in the main tables of this book is assured if the available data are used to construct an equation of state from which all the other properties can be evaluated by mathematical manipulation. The most convenient independent function to use is the Helmholtz energy and so the appropriate independent variables are density and temperature. The dimensionless function selected for use in this book is a reduced Helmholtz energy, $A/(RT)$, represented by

$$\frac{A}{RT} = \alpha(\omega,\tau) + \ln(\omega/\omega_a) + \alpha^{id}(\tau).$$

The dimensionless density and temperature variables are ω and τ; α is a function which represents the behaviour of the real fluid, and the ideal gas is represented by α^{id} together with the logarithmic term. Since there is no absolute scale of Helmholtz energy an arbitrary reference state has been taken as the point (ω_a,τ_a) in the ideal gas where S^{id} and H^{id} are both set to zero. All other thermodynamic properties which are tabulated in the main tables of this book can be derived from this single equation by differentiation alone.

The major portion of Section 1 of the text of this book is concerned with a discussion of the available data and the accuracy with which they are represented by both the wide-range equation of state and the critical-region equation. The available equations of state are discussed in Section 2, and a description is given of the construction of the chosen main equation of state. For the convenience of users who are only interested in restricted states of the fluid, a number of auxiliary equations are given in Section 3. Equations are given for the vapour pressure, the sublimation pressure and the density-temperature relations of the saturated liquid and vapour. Separate equations are given which represent the temperature dependence of the isobaric heat capacity, entropy and enthalpy of the ideal gas. A separate equation is also given which represents the behaviour of the second virial coefficient. Section 4 explains how the tabulated properties were calculated from the chosen equation of state and gives tabulations of the derived functions in order to assist those who wish to prepare computer programs for them.

The properties tabulated in the main tables of this book are the volume, entropy, enthalpy, isobaric heat capacity, compression factor, fugacity/pressure ratio, Joule–Thomson coefficient, ratio of the heat capacities and speed of sound as functions of pressure and temperature; also the pressure, entropy, internal energy and isochoric heat capacity as functions of density and temperature for the gas and liquid states from 0.025 to 270 MPa at temperatures from 104 to 320 K, and from 0.025 to 40 MPa for temperatures from 320 to 450 K. Zero pressure tables are given, as are tables of the properties of the fluid phases along the saturation curve and the melting curve.

The main equation of state which has been used to calculate the tables in this book has been included in the Imperial College Equations of State Computer Package.

Since there are now a considerable amount of experimental data for the critical region, this is discussed separately. The choice of a critical-region equation is discussed in Section 2, together with a description of the methods and data used to fit the system-dependent parameters. Section 4 explains the method for calculating the properties.

The critical-region properties which are tabulated in this book are pressure, internal energy, enthalpy, entropy, isochoric heat capacity, isobaric heat capacity and speed of sound as a function of density and temperature, and the same properties along the saturation curve.

Computer programs for generating thermodynamic properties from the critical region equation are given in reference.

Ethylene (Ethene). International Thermodynamic Tables of the Fluid State — 10 *is edited by K. Marjorie de Reuck and published by Blackwell Scientific Publications Ltd, Oxford, UK, 1988. xxvi + 299 pp. ISBN 0-632-01709-0. Price GBP 42.50/USD 65.00, Affiliate Members Price GBP 31.90/USD 48.80.*

Greek translations

Greek translations of the 1970 edition of *Nomenclature of Inorganic Chemistry* (The Red Book) and the 1977 edition of *How to name an inorganic substance: A guide to the use of nomenclature of inorganic chemistry* have recently been published.

For further information of these publications please contact: Association of Greek Chemists, 27 Kaningos Street, Athens 106 82, Greece.

ISCU strikes back

Readers familiar with these pages will know that the acronym for the International Council of Scientiftic Unions is ICSU. Moreover, they will know that on rare occasions (see page 208 of the November 1987 issue of *CI*) we have got it wrong and called the council ISCU.

Now, it would seem ICSU has got its own back. On page 46 of *Guidelines for Printing and Publishing* Published by ICSU Press, our esteemed International Union of Pure and Applied Chemistry is referred to as IUPAB (which, incidentally, is the acronym for International Union of Pure and Applied Biophysics).

The guidelines provide practical information about such matters as copyright, the preparation of camera-ready copy, pricing of books and journals, what a subscription agent does, and promotion activities. A separate section describes the ICSU Press "Short Reports", an original format for communicating research results, methodology and bibliography in a particularly condensed style.

The booklet was prepared as a service to ICSU family members, especially those who may wish to undertake their own publishing but who lack experience.

Guidelines for printing and publishing *is published by ICSU Press, Paris, France. 1988. 52 pp. ISBN 0 930357 16 7. Price (postpaid) USD 10.00 to ICSU members and USD 25.00 for non-members.*

IUPAC Handbook 1987–1989

The price of the *IUPAC Handbook 187–1989* is GBP 25.00/USD 32.00. Affiliates may purchase the book at a concessionary price of GBP 12.50/USD 16.00, and not USD 12.50 as erroneously stated on page 221 of the November 1988 issue of *CI*.

A page giving details of projects 6/81 to 18/87 of the Commission on Macromolecular (IV.1) was omitted from the current programmes section of the handbook. This page should have come after page 157. Copies of the missing page are available upon request from the IUPAC Secretariat.

Hungarian translation

The IUPAC document "Notation for states and processes, significance of the word standard in chemical thermodynamics, and remarks on commonly tabulated forms of thermodynamic functions" (Recommendations 1981: Appendix No. IV to *Manual of Symbols and Terminology for Physicochemical Quantities and Units*) published in *PAC*, Vol. 54, No. 6, pp. 1239–1250, 1982, has been translated into Hungarian. The translation appeared in *Magyar Kémiai Folyóirat* 93. évf. 9. sz. pp. 417–424, 1987.

PAC Review

Pure and Applied Chemistry (PAC) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Rich phase behaviour of colloidal systems

One of the classical challenges of the physical chemistry of ligands is to understand the relation between the microscopic molecular interactions and the macroscopic thermodynamic properties.

In colloid science a thermodynamic property of high relevance is the phase equilibria since one often finds a much richer phase behaviour than in simpler liquids. The phase behaviour is particularly rich for self-associating molecules, like surfactants in water, and it is essential in any study of such systems to establish the phase behaviour. This has lead to an accumulation of a large amount of experimental data on phase behaviour. It is only during recent years that serious and extensive attempts have been made to interpret these experimental finding in terms of microscopic models.

There is a two-fold purpose of establishing such relations between molecular interactions and phase behaviour. The observed thermodynamic equilibrium data provide information on the situation on the molecular level that can be very difficult to obtain by other means. On the other hand a good understanding of the molecular features that are controlling the equilibrium between different phases makes it possible to design systems with desirable phase properties.

Håkan Wennerström (Chemical Center, Lund,

The Lund University Chemical Centre is the largest institute for chemical research in Sweden and comprises some 20 departments for education and research. Hakan Wennerström from its Division of Physical Chemistry 1 presented a plenary lecture on colloidal systems at the 6th International Conference on Surface and Colloid Science in Japan. (*Photo courtesy Per Lindström, Lund.*)

Sweden) discussed four different examples of how one can understand the relation between phase behaviour and molecular interactions in a plenary lecture on "Intermolecular interactions and phase equilibria in colloidal systems" presented at the 6th International Conference on Surface and Colloid Science held in Hakone, Japan, 5–10 June 1988.

The four cases chosen by Wennerström illustrated the different approaches to the problem. They showed that, depending on the particular chemical nature of the problem, the modelling involves rather different conceptual frameworks. The four problems were:

- the effect of cholesterol on phospholipid phase behaviour,
- phase equilibria in ionic surfactant systems,
- the nature of the L_3 phase,
- incompatibility in aqueous two polymer systems.

Wennerström's lecture and six other plenary lectures from the Hakone conference were published in the October 1988 issue of *PAC*. They included a lecture on "Colloidal metals: past, present and future" by CHEMRAWN chairman John M. Thomas (The Royal Institution, London, UK).

Thomas's lecture provided a critical assessment of the various X-ray and electron-based methods of determining the structure of ultrafine metallic particles of colloidal dimension. In particular, he illustrated examples of the use and potential of high-resolution electron microscopy of high-angle Rutherford scattering and of scanning tunneling microscopic procedures.

Prof John M. Thomas: "My own interest in metals of colloidal dimension began some time ago when I realized that topographical features on the surface of graphite could be rendered visible by decoration with ultrafine particles of gold or platinum.

Table. Popular topics in the science of colloidal metal.

1. Preparation of high-area materials for use as: catalysts, photocatalysts, adsorbents and sensors, ferrofluids; biological stains; decorating agents for assessing topography of surfaces; novel optical and nanotechnological devices .
2. Structure challenges:
Why are there magic numbers (13, 55, 147) of atoms in the more stable naked clusters?
How may their structures be reliably determined?
Why do simple theoretical (e.g. atom–atom approaches) cope so well with magic numbers, binding energies and the energies of coulombic explosions?
Are metallic clusters of colloidal dimension fluxional?
3. Thermodynamic consequences:
How may one best capitalize on the difference in melting point, surface energy, electrode potential, ionization energy, etc., between small cluster and bulk materials?
4. Biological consequences of small particles.

He identified several growth points of current and possible future uses of colloidal metals (see table) and discussed the role of a variety of colloidal metals in (gas–solid) catalysis, in photocatalysis and in the photogeneration of organic material. He also briefly touched upon the prospects of fine-tuning colloidal catalysts.

Cationic polymerizations and other ionic processes

IUPAC SPONSORED

Strasbourg, France, 6–9 June 1989

The 9th International Symposium on Cationic Polymerizations and Related Ionic Processes is co-sponsored by IUPAC and the French Polymer Group (GFP). It will be dedicated to Prof. Michael Szwarc, on the occasion of his 80th birthday, in recognition of his outstanding scientific achievements in the field of ionic polymerizations.

Previous meetings of this series have been mainly devoted to cationic polymerizations including ring-opening polymerizations. It was found appropriate, this time, to broaden the scope, and to cover anionic as well as cationic polymerizations to take account of so many similarities in the mechanisms involved, in the experimental methods used and in the applications expected.

The two main scientific themes of the symposium are:

1. *Mechanisms involved in ionic and pseudo-ionic polymerizations*, with emphasis on the most recent developments, such as living cationic polymerizations, activated monomer polymerizations, insertion processes, group transfer polymerizations, and others.

2. *Applications of ionic polymerizations to polymer synthesis*, including macromolecular engineering via ionic polymerization methods.

The symposium will include invited lectures and communications, each of which will be followed by a discussion. In addition, two poster sessions and a panel discussion are scheduled to give participants opportunities to share experiences, to discuss hypotheses.

The following will present invited lectures at the symposium: Dr G. L. Collins (Celanese Corp., UA), Prof. M. Fontanille (University of Bordeaux, France), Dr E. Franta (CNRS, France), Prof. E. Goethals (University of Ghent, Belgium), Prof. J. P. Kennedy (Polymer Institute, USA), Prof. H. R. Kriecheldorf (University of Hamburg, FRG), Dr Axel Muller (University of Mayence, FRG), Prof. O. Nuyken (University of Bayreuth, FRG), Dr. S. Penczek (Polish Academy of Sciences), Prof. R. Quirk (University of Kyoto, Japan), Prof. P. Sigwalt (University of Pierre an Marie Curie, France) and Dr D. Y. Sogah (Du Pont, USA).

Study of fats

IUPAC SPONSORED

Angers, France, 6–9 June 1989

The Association Française pour l'Étude des Corps Gras will host the Chevreul International Congress for the Study of Fats at the Centre de Congrès, Angers.

The congress, which is the First Eurolipid Convention, will mark the centenary of the death of Michel-Eugène Chevreul who was born in Angers in 1786 and died in 1889. As a result of his chemical research on fats of animal origin, he showed, as early as 1823, that organic matter is subject to the same laws as mineral compounds.

The scientific programme of the congress will be divided into three themes: research, processes and products, and information.

Research

The purpose of this topic is to present original work in the following fields:

- New lipid sources
- Genetic changes (sunflower, rape seed, soya bean, palm, etc.)
- Constitution and analysis (glyceridic composition, minor constituents, contaminants)
- Chemical properties and new reactions resulting in new compounds
- Physical and rheological properties
- Biochemical and nutritional properties
- Biotechnology
- Place of virgin lipoids (olives etc.) and sensorial properties (texture and flavour)

Processes and products

The aim of this theme is to present new results concerning:

- Production, refining and transformation technologies in the fats industries (from raw material to finished products for alimentary or industrial purposes).
- Needs and concerns of users (agro-food industries, in particular health and diet products, cattle foods, pharmaceutical and cosmetic industries, surface agent industries, lubricant and hydrocarbon industry, paint and varnish industry, macromolecule industry).

Information

This part of the programme will provide prescribers (physicians, nutritionists, dieticians, teachers, consumer representatives, journalists) and users (scientific and technical executives in production and utilization industries, organization directors) with in-

Michel-Eugène Chevreul
1786–1889

formation concerning the current state of knowledge about fats today and prospects, especially in terms of market trends and regulation changes.

Angers is located in the heart of the Loire Valley, the "Garden of France". It has over 220 000 inhabitants and is blessed with a truly mild climate. The past of Angers is ever present with its magnificent castle which houses the famous Apocalypse tapestry, with its museums where one can view the "Song of the world" tapestry by Jean Lurçat and the sculptures of David d'Angers.

Angers, a modern city with its Congress Centre in the heart of the town, offers visitors quality hotel accommodation, memorable evenings in historic castles, and many sightseeing tours of the Loire Valley. The region is also famous for its flowers and fine wine.

The city is only $2\frac{1}{2}$ hours away from Paris by train or by car, and can also be easily reached from the international airport of Nantes.

IUPAC SPONSORED

Coordination chemistry
Gold Coast, Australia, 2–7 July 1989

The 27th International Conference on Coordination Chemistry will be held at Broadbeach on Queensland's Gold Coast, Australia's prime tourist resort area, approximately 80 km south of the state capital, Brisbane.

Access for international air travellers is available through Cairns, Townsville, Brisbane or Sydney. Internal flights operate into Brisbane and directly into the Gold Coast. There are frequent hovercraft and bus connections between the Gold Coast and Brisbane airport.

The conference centre offers first class accommodation recreational and conference facilities, and is part of a complex which includes jupiters Casino. There is ample alternative accommodation available in both motel and holiday apartments close to the conference venue.

Many top-class restaurants and night spots are located in the area, particularly in adjacent Surfers Paradise, which is linked to the conference venue by shuttle bus, ferry and taxi.

The average temperatures are 21°C (day) and 10°C (night) and the clear sunny weather which characterizes the northern Australian "winter" will encourage participants to enjoy the extensive surfing beaches and other outdoor pursuits such as bushwalking in the tropical rainforests of the hinterland.

The meeting will consist of six plenary and approximately 40 section lectures, with poster sessions arranged to match the themes of the conference. Two half days have been set aside for recreational pursuits.

The plenary lectures are:

- Technetium chemistry and its use in medical diagnosis, (A. Davison, USA).
- Organometal oxides, a borderline class of compounds between inorganic and organometallic chemistry: synthetic, structural, and catalytic aspects (W. A. Herrmann, FRG).
- Intramolecular control of excited state electron transfer (T. J. Meyer, USA).
- Transition metal thiolates: synthetic, catalytic, and

Gold Coast, Australia, venue of the 27th International Conference on Coordination Chemistry.

biomimetic aspects (A. Nakamura, Japan).
- Interlacing molecular threads on transition metals (J-P. Sauvage, France).

The G. J. Burrows Lecture will be presented by M. I. Bruce (Australia) and entitled "Carbenes, carbides and carbon transformations of alkynes at metal centres."

The official language of the conference is English. There will be no provision for simultaneous translation.

The registration fees are (before/after 26 May): for delegates, AUD 340/380; accompanying persons AUD 120/120; student delegates AUD 100/300; day registrants AUD 120/140.

The conference programme will include a mixer following the opening ceremony, excursions and a conference banquet. Pre- and post-conference tours have also been arranged.

A number of satellite meetings of interest to ICCC participants will be held in Australia in the week preceding and the week following the ICCC meeting: 14th International Symposium on Macrocyclic Chemistry (Townsville, North Queensland, 25–28 June); Symposium on Marine Bioinorganic Chemistry (Heron Island Research Station, North Queensland, 29 June–2 July); 9th International Conference on Proteins of Iron Storage and Transport (University of Queensland, Brisbane, 9–13 July); Symposium on Metal Compounds in the Detection and Treatment of Cancer (Marysville, Victoria, 10–12 July); Symposium on Applied Organometallic Chemistry: and Entry to the New Technology (Hunter Valley, New South Wales, 10–12 July); Biennial Conference of the Chemical Education Division of the Royal Australian Chemical Institute (University of Queensland, Brisbane, 26–29 June).

Phosphorus chemistry

IUPAC SPONSORED

Tallinn, USSR, 3–7 July 1989

The 11th International Conference on Phosphorus Chemistry will be held in Tallinn Technical University, Ehitajate tee 5.

The conference will cover all aspects of phosphorus chemistry (organic, inorganic, biological and applied). The following themes aim at defining the general orientation of the conference, but are by no means intended to exclude any other new theme of broad interest, especially those which are developing on the borderline between phosphorus chemistry and other areas of science, or which promise useful applications:

Section 1
Synthesis, structure, stereochemistry and reactivity of organophosphorus compounds

- new synthetic methods in phosphorus chemistry
- organic synthetic methods based on phosphorus-containing reagents
- stereochemistry, stereodynamics and stereoelectronic effects
- reactivity and reaction mechanisms
- photochemistry of phosphorus compounds
- applications

Section 2
Chemistry of phosphorus compounds in particular coordination and bonding

- new synthetic methods and types of compounds
- new reactions.

Section 3
Chemistry of phosphorus coordination compounds

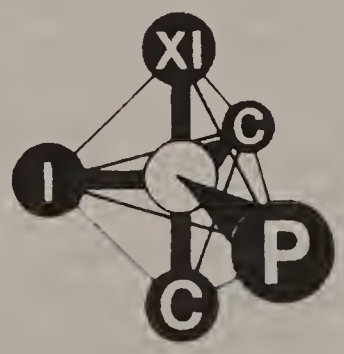
- new phosphorus ligands and complexes
- reactivity of coordination phosphorus ligands
- applications

Section 4
Biochemical aspects of phosphorus chemistry

- biologically active compounds (natural and synthetic)
- enzymatic phosphoryl transfer reactions
- 31 P NMR-spectroscopy *in vivo* and *in vitro*
- ecological aspects.

Section 5
Chemistry of phosphates, including condensed phosphates and apatites and inorganic phosphorus compounds

- synthesis, structure, reactivity and reaction mechanisms of monomeric and polymeric phosphates
- compounds with P-N, P-S, P-Hal, P-Met bonding



and containing phosphorus with lower valencies
- inorganic phosphorus materials.

The registration fees after 1 March 1989 are: for conference participants SUR 100; conference participants of age less than 30 years SUR 75; and accompanying guests SUR 50. IUPAC affiliates are entitled to a 10% reduction.

The visit can be arranged through "Intourist". Accommodation is offered in the range SUR 54 to SUR 106 per person per night. Social events include a

welcoming mixer, reception given by the Mayor of Tallinn, concert of theatre performance, excursion and banquet.

Daytime temperatures in Tallinn in early July can be quite variable but more likely to be on the pleasant side (17°C). Some rain can be expected.

Analytical chemistry
Cambridge, UK, 30 July–5 August 1989

IUPAC SPONSORED

An International Conference on Analytical Chemistry will be held at the University of Cambridge, 30 July to 5 August 1989. This is the 9th in the series of triennial conferences initiated by the Society of Analytical Chemistry (SAC) in 1965.

The lecture and poster sessions of SAC 89 will be held at the Sidgwick Avenue site of the University of Cambridge. Accommodation and meals will be in King's and Queen's Colleges of the university.

The **scientific programme** will be organized around plenary, invited and contributed papers, which will take the form of both oral and poster presentations covering the whole field of analytical chemistry. As at previous SAC conferences, special sessions on particular analytical themes will be organized by interested subject groups. The programme will include workshops, where research workers can demonstrate new apparatus and technique. Update courses have been arranged to provide intensive all-day tutorial and practical demonstration sessions.

There will be four **plenary lectures:**

- Enhancement of instrumental analysis by flow injection techniques (Prof. J. Ruzicka, USA).
- Practical applications of an understanding of chiral recognition requirements (Prof. W. H. Pirkle, USA).
- Evolutions in chemometrics (Prof. G. Kateman, Netherlands).
- Light and life — some recent applications of chemiluminescence and enzymes in analytical chemistry (Prof. A. Townshend, UK).

All presentations will be in English.

The following **workshops** have been proposed at which research workers will demonstrate new apparatus and techniques:

- atomic spectroscopy
- trace enrichment — affinity chromatography
- computer-aided learning material (produced by ACOL)
- sensors
- handling micro-samplers
- flow injection analysis
- chemometrics.

Updates are intensive one-day short courses with professional tuition by internationally recognized practioners and experienced teachers. They aim to provide an introduction to basic concepts allied to a survey of applications and future trends. The format is a mix of lectures and tutorials with relevant practical demonstrations and experience. The following courses are planned:

1. Chiral separations.
2. Chemiluminescence and bioluminescence.
3. Near-infrared spectroscopy.
4. Laser-based analytical mass spectrometry.
5. Information technologies for analytical chemists.

It is also hoped that the following **special sessions** will be included in the scientific programme:

- aspects of chromatography
- general chemical analysis
- food
- the dispersed automated laboratory
- combined techniques in molecular spectroscopy.

The scientific work of the conference will be centred around the presentation and discussion of contributed papers on all aspects of analytical chemistry.

Comprehensive social programmes for delegates and accompanying persons have been planned and will include both evening functions and daytime tours of cultural and scenic interest. There will also be industrial visits and a book and manufacturers' literature exhibition.

Registration fees (excluding accommodation, meals and much of the social programme) are for Royal Society of Chemistry members and members of organizing bodies GBP 140; non-members GBP 200; retired and unemployed members, student members and all accompanying persons GBP 40. There is a separate registration fee for SAC 89 participants for the update courses: GBP 80.

Participants will be accommodated in a variety of single study bedrooms in King's and Quenns' Colleges. A limited number of rooms have private bathrooms; these will be at higher cost. A small number of twin-bedded rooms are available.

Polymer blends
Prague, Czechoslovakia, 17–20 July 1989

IUPAC SPONSORED

The 32nd Prague Microsymposium on Macromolecules: Polymer Blends aims to bring together academic and industrial polymer scientists and engineers concerned with polymer blends and to stimulate discussions about recent developments and future trends in this field.

Attention will be focused on theoretical and experimental studies investigating relationships between properties, structure and formation of polymer blends. Contributions covering the state of art in the preparation (especially melt compounding), thermodynamics,

rheology, morphology, processing and performance of polymer blends ranging from impact resistant plastics to thermoplastic elastomers are invited.

The topics of the microsymposium are:

1. Structure of polymer blends in relation to their methods of preparation.
2. Thermodynamic and kinetic aspects of polymer blend formation.
3. Rheological behaviour of molten polymer blends.
4. Processing of polymer blends in relation to their structure and properties.
5. Mechanical and other physical properties of polymer blends in relation to their structure.
6. Role of chemical reactions in polymer blend preparation and performance.

Scientists from the following countries have been invited to present the main lectures: Canada, Denmark, FRG, GDR, Italy, UK, USA and USSR. All sessions of the meeting will be held in the Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Prague.

Participants are invited to take part in the social events and a special programme will be arranged for accompanying persons. The registration fee, excluding accommodation, with be DEM 250.

Expert systems technology

The 5th International School on Expert Systems Technology will be held at the Technical University of Rzeszow, Poland, from 27 to 30 June 1989.

Further information from: Prof. Z. S. Hippe, 5th School, Department of Physical Computer Chemistry, Technical University 6 Al. Powstancow Warszawy, 35-041 Rzeszow, Poland.

Polymer analysis and characterization

The 2nd International Symposium on Polymer Analysis and Characterization will be held from 7 to 9 April 1989 at Austin, Texas, USA. This two and one half day symposium will consist of poster sessions, invited lectures, and round table discussions on recent advances in polymer characterization techniques and selected applications.

Topics will include size exclusion chromatography, fractionation, light scattering, microscopy, NMR, thermal analysis, fluorescent techniques, and methods relating to solid state and surface characterization.

For further information and registration forms, please contact Dr Howard G. Barth, Du Pont Co., Experimental Station, P.O. Box 80228, Wilmington, DE 19880-0228. Tel: +1 (302) 695 4354.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in brackets.

1989

Inorganic materials at high temperatures

3–7 April. 6th International Conference on High Temperatures: Chemistry of Inorganic Materials at High Temperatures. Gaithersburg, Maryland, USA.
(Dr J. W. Hastie, High Temperature Materials Chemistry 89, Building 223, Room B106, National Institute of Standards and Technology, Gaithersburg, MD 20899, USA.)

Cationic polymerization

5–9 June. 9th International Symposium on Cationic Polymerizations and Other Ionic Processes. Strasbourg, France.
(Secretariat of the 9th Symposium on Cationic Polymerizations, Institut Charles Sadron (CRM/EAHP), 6 Rue Boussingault, 67083 Strasbourg Cedex, France.)

Fats

6–9 June. Chevreul International Congress for the Study of Fats. Angers, France.
(Chevreul International Congress Angers 1989, Centre de Congrès, 33 boulevard Carnot, 49100 Angers, France.)

Molecular design of functional polymers

26–28 June. International Symposium on Molecular Design of Functional Polymers. Seoul, Korea. (IUPAC Symposium Secretariat, c/o Prof. Sung Chul Kim, Dept of Chem. Eng., KAIST, PO Box 131, Cheongyrang, Seoul 130–650, Korea.)

Coordination chemistry

2–7 July. 27th International Conference on Coordination Chemistry. Queensland, Australia.
(XXVII ICCC, UniQuest Limited, University of Queensland, St. Lucia, Queensland 4067, Australia.)

Phosphorus chemistry

3–8 July. 11th International Conference on Phosphorus Chemistry. Tallinn, USSR.

(ICPC-1989, Tallinn Technical University, Ehitajate Tee 5, Tallinn 200108, USSR.)

Polymer blends

17–20 July. 32nd Microsymposium on Macromolecules: "Polymer Blends". Prague, Czechoslovakia. (32nd Microsymposium, PMM Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague, Czechoslovakia.)

Heteroatom chemistry

17–22 July. 2nd International Conference on Heteroatom Chemistry (ICHAC-2). Albany, New York, USA.
(Prof. Eric Block, Department of Chemistry, SUNY at Albany, Albany, New York 12222, USA.)

Bioinorganic chemistry

24–28 July. 4th International Conference on Bioinorganic Chemistry. Cambridge, Massachusetts, USA.
(Prof. K. D. Karlin, Chairman, ICBIC-4, Department of Chemistry, SUNY at Albany, Albany, NY 12222, USA.)

Analytical chemistry

30 July–5 August. SAC 89: International Conference on Analytical Chemistry. Cambridge, UK.
(Miss P. E. Hutchinson, Secretary of the Analytical Division, Royal Society of Chemistry, Burlington House, London W1V 0BN, UK.)

IUPAC Congress

2–7 August. 32nd IUPAC Congress. Stockholm, Sweden. (IUPAC. c/o Stockholm Convention Bureau, Box 6911, S-102 39 Stockholm, Sweden.)

Solution chemistry

6–11 August. 20th International Conference on Solution Chemistry. Jerusalem, Israel.
(Secretariat XX ICSC, PO Box 50006, Tel Aviv 61500, Israel.)

IUPAC General Assembly

9–17 August. 35th IUPAC General Assembly. Lund, Sweden. (The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.)

Heterocyclic chemistry

13–17 August. 12th International Congress of Heterocyclic Chemistry (ICHC). Jerusalem, Israel. (12th ICHC Congress, PO Box 50006, Tel Aviv 61500, Israel.)

Chemical education

20–25 August. 10th International Conference on Chemical Education. Waterloo, Canada.
(Prof. C. Chieh, Department of Chemistry, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1.)

Visas

It is a condition of sponsorship that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all *bona fide* chemists from throughout the world to attend irrespective of race, religion, or political philosophy.

IUPAC sponsorship implies that entry visas will be granted to all *bona fide* chemists provided application is made not less than three months in advance. If a visa is not granted one month before the meeting the IUPAC Secretariat should be notified without delay by the applicant.

Novel aromatic compounds

20–25 August. 6th International Symposium on Novel Aromatic Compounds. Tonaka, Osaka, Japan.
(Prof. Hiizu Iwamura, General Secretary of ISNA-6, Department of Chemistry, Faculty of Science, The University of Tokyo, Bunkyo-ku, Tokyo 113, Japan.)

Calorimetry and chemical thermodynamics

25–28 August. International Conference on Calorimetry and Chemical Thermodynamics. Beijing, China.
(Prof. Hu Ri-heng, Institute of Chemistry, Academia Sinica, Beijing, China.)

Mössbauer effect

4–8 September. International Conference on the Applications of the Mössbauer Effect. Budapest, Hungary.
(ICAME '89, Central Research Institute for Physics, H-1525 Budapest, PO Box 49, Hungary.)

Plasma chemistry

4–8 September. 9th International Symposium on Plasma Chemistry. Pugnochiuso, Italy.
(Secretariat, ISPC-9, Centro Internazionale Congressi, V.le Papa Pio XII, 18-70124 BARI, Italy.

Vapour-liquid equilibria

6–8 September. 5th International Workshop on Vapour-Liquid Equilibria in 1-Alkanol + n-Alkane Mixtures. Trieste, Italy.
(Prof. P. Alessi, 1st Chimica Appl. Ind., University of Trieste, Trieste, Italy.)

Thin solid and liquid films

11–13 September. International Symposium on Thin Solid and Liquid Films. Bristol, UK.

(The Conference Secretariat, (Thin Solid & Liquid Films), Society of Chemical Industry, 14/15 Belgrave Square, London SW1X 8PS, UK.)

Electrochemistry

17–22 September. 40th International Society of Electrochemistry Meeting. Kyoto, Japan.
(Prof. Yasuhiko Ito, Secretary General, The 40th ISE Meeting, c/o Kyoto International Conference Hall, Takaraga-ike, Sakyo-ku, Kyoto 606, Japan.)

Flame Structure

18–22 September. 3rd International Seminar on Flame Structure (ISFS-89), Alma-Ata, USSR.
(Prof. Yu. N. Molin, Institute of Chemical Kinetics & Combustion, Siberian Division, Academy of Sciences of the USSR, Novosibirsk, 630090, USSR.)

Nitroxide radicals

18–22 September. International Conference on Nitroxide Radicals (ICNR-89). Novosibirsk, USSR.
(Dr. V. V. Martin, Secretary of ICNR-89, Institute of Organic Chemistry, Siberian Division of the Academy of Sciences of the USSR, Novosibirsk-630090, USSR.)

Organometallic chemistry

1–6 October. 5th International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS V). Florence, Italy.
("OMCOS-V", Dipartimento di Chimica Organica, University of Florence, Via G. Capponi, 9-50121 Florence, Italy.)

1990

Natural products

4–9 February. 17th International Symposium on the Chemistry of Natural Products. New Delhi, India.
(Dr. A. V. Rama Rao, Secretary, 17th IUPAC International Symposium on the Chemistry of Natural Products, Regional Research Laboratory, Hyderabad 500 007, India.)

Polymer analysis and characterization

Spring. 3rd International Symposium on Polymer Analysis and Characterization. Dresden, German Democratic Republic.
(Dr Howard G. Barth, Du Pont Company, Experimental Station, Wilmington, Delaware 19898, USA.)

Porous solids

6–9 May. 2nd International Symposium on Characterization of Porous Solids (COPS-2). Alicante, Spain.
(Prof. F. Rodriguez-Reinoso, Departamento de Quimica Inorgánica e Ingeniería Química, Facultad de Ciencias, Universidad de Alicante, Apartado 99, Alicante, Spain.)

Macromolecules

8–13 July. 33rd International Symposium on Macromolecules. Montreal, Canada.
(Prof. R. E. Prud'homme, Department of Chemistry, Laval University, Sainte-Foy, Quebec, Canada G1K 7P4.)

Organic synthesis

23–27 July. 8th International Conference on Organic Synthesis. Helsinki, Finland.
(Prof. Tapio Hase, Department of Chemistry, University of Helsinki, Vuorikatu 20, SF-00100 Helsinki, Finland).

Pesticide chemistry

5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, Federal Republic of Germany.
(Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Physical organic chemistry

6–10 August. 10th International Conference on Physical Organic Chemistry. Haifa, Israel.
(Prof. Yitzhak Apeloig, Department of Chemistry, Technion-Israel Institute of Technology, Haifa, 320000, Israel.)

Raman spectroscopy

13–17 August. 12th International Conference on Raman Spectroscopy. Columbia, South Carolina, USA.
(Prof. J. R. Durig, Department of Chemistry, University of South Carolina, Columbia, Columbia, South Carolina 29208, USA.)

Safety in chemical production

10–13 September. 1st IUPAC Workshop on Safety in Chemical Production. Basel, Switzerland.
(This workshop is not open for general participation but restricted to a limited number of invited participants.)

1991

Organometallic chemistry

25–29 August. 6th International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS). Utrecht, Netherlands.
(Prof. G. van Koten, Laboratory of Organic Chemistry, Department of Metal Mediated Synthesis, University of Utrecht, Paduälaan 8, 3584 CH Utrecht, Netherlands.)

The Determination of Trace Metals in Natural Waters

Edited by

T. S. West, The Macaulay Institute, Aberdeen, and The Late **H. W. Nürnberg**, Institut für Chemie der Kernforschungsanlage Julich, GmbH, Federal Republic of Germany.

IUPAC

Published on behalf of the International Union of Pure and Applied Chemistry by Blackwell Scientific Publications

Each field of chemistry is confronted with the problem of monitoring water quality and research on trace chemical compounds. This text is designed to meet the needs of the many potential users for reliable guidelines and methods of the analysis of trace elements in natural waters, e.g. analytical chemists, hydrologists, oceanographers, toxicologists, ecologists, etc involved in the quality control of natural waters and the detection of traces. This project, initiated by T. S. West, President of the Division of Analytical Chemistry of IUPAC, in 1979, is intended to offer chemists and related scientists a survey of available methods, showing their respective performances, their areas of application and, in general, information that will enable them to apply the data to the resolution of specific problems.

Outline of Contents:

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Contents of Part II: Introduction to the solubility of liquids in liquids. The phase behavior of water-hydrocarbon systems. Compilations and critical evaluations of reported solubility data for all C_8— C_{36} hydrocarbons. Styrene. *o*-, *m*- & *p*-Xylene. Ethylbenzene. 4-Vinyl-l-cyclohexene. 1-Propenylcyclopentane. 1-Octyne. 1,1,3-Trimethylcyclopentane. Isopropylcyclopentane. Propylcyclopentane. *cis*-1,2-Dimethylcyclohexane. 1,4-Dimethylcyclohexane. Ethylcyclohexane. Cyclooctane. 1- & 2-Octene. 2,2,4- & 2,3,4-Trimethylpentane. 2,3- & 2,4-Dimethylhexane. 3-Methylheptane. Octane. Indan. 1,2,3- & 1,2,4-Trimethylbenzene. Mesitylene. Cumene. Propylbenzene. 1,8-Nonadiyne. 1-Nonyne. Butylcyclopentane. 1,1,3-Trimethylcyclohexane. 2,2,5-Trimethylhexane. 2,6-Dimethylheptane. 2-, 3- & 4-Methyloctane. Nonane. Naphthalene. 1,2,4,5-Tetramethylbenzene. *p*-Cymene. Diethylbenzene. *tert*-Butylbenzene. *sec*-Butylbenzene. Butylbenzene. *d*-Limonene. Bicyclo [4.4.0] decane. Pentylcyclopentane. 1-Decene. 2,7-Dimethyloctane. Decane. 1- & 2-Methylnaphthalene. 2-Ethyl-1,3,5-trimethylbenzene. *tert*-Pentylbenzene. 3-Methylbicyclo [4.4.0] decane. Hexylcyclopentane. Acenaphthene. Biphenyl. 1,3-, 1,4-, 1,5-, 2,3- & 2,6-Dimethylnaphthalene. 1- & 2-Ethylnaphthalene. 2-Allyl-1,3,5-trimethylbenzene. 1-Phenylhexane. Dodecane. Fluorene. 1,4,5-Trimethylnaphthalene. (2-Ethylcyclopentyl) benzene. 2-Cyclopentyloctane. Tridecane. Anthracene. Phenanthrene. (*E*)-Stilbene. 1,4-Dicyclopentylbutane. Tetradecane. 2- & 9-Methylanthracene. 1-Methylphenanthrene. Fluoranthene. Pyrene. Picene. 10-Butylbenz[*a*]anthracene. 7-Pentylbenz[*a*]anthracene. Coronene. Hexacosane. Hexatriacontane. System index. Registry number index. Author index.

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 44 countries, each represented by a national organization, such as an academy of science or research council.

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Chemistry International

IUPAC

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Front Cover: The 8th International Biotechnology Symposium took place in Paris in July 1988: report on page 92. *(Photo courtesy CIBA-GEIGY Limited.)*

1988 International Union of Pure and Applied Chemistry

Outsiders looking in?

Editorial

In his Secretary General's column in the November 1988 issue of *Chemistry International*, Prof. Tom West invited affiliates to express their views on IUPAC's existing programmes and on any other matter related to our union. Some affiliates have responded to this request and we are grateful for the feedback they have provided.

Graham Ellis's letter published on page 92 of this issue is a typical response. Ellis suggests that, although he enjoys reading *CI*, he has the distinct impression of being an outsider looking in — at least as far as getting involved in the work of IUPAC is concerned.

On page 11 of the January 1989 issue I suggested that this sort of impression and the resulting disillusionment with this aspect of the affiliate membership scheme may have been one of the reasons for the slight decline in affiliate numbers in 1988.

Unfortunately, as I have pointed out before (see *CI*, page 168, September 1987), the opportunities for affiliates becoming members of the IUPAC commissions and committees are limited. At present there are over 7000 affiliates whereas the number of chemists serving on IUPAC commissions and committees probably does not exceed 1500. Furthermore, since these chemists may serve for up to 12 years, only a few vacancies arise on each commission or committee every two years (at the time of the general assemblies). During the Boston general assembly only a handful of affiliates were appointed (see *CI*, page 96, May 1988).

Now for the good news

So much for the bad news. Here is the good news. Affiliates CAN get involved in the work of the union and indeed IUPAC depends extensively on such contributions from chemists around the world. The following are examples of appeals for help which have appeared in the pages of *CI* in recent months:

- Invitation to all readers (including affiliates) to comment on what IUPAC is (or is not) doing in relation to restructuring (page 59, March 1989).
- Volunteers needed to help with database (page 66, March 1989).
- IUPAC seeks your comments: Glossary of atmospheric chemistry terms (page 70, January 1989).
- IUPAC seeks your comments: Terminology in semiconductor electrochemistry and photoelectrochemistry energy conversion (page 70, January 1989).
- "Affiliates are encouraged to make contributions to *CI*" (page 9, January 1989).
- *Opinions please*: Glossary of terms used in physical organic chemistry (page 137, July 1988).

I recognize that many affiliates will not have the appropriate expertise in the topics referred to above and therefore may not be able to offer assistance. However, this is not the only route into the work of commissions. Affiliates have always been encouraged to communicate directly on scientific matters with the officers of IUPAC commissions (see, for example, *CI*, page 9, January 1989). This is one way for affiliates to draw attention to their expertise and to establish whether this will be of benefit to the commission or not. The names and addresses of all commission officers (chairpersons and secretaries) are published in an issue of *CI* soon after each general assembly (see, for example, *CI*, November 1987).

This process of scientific communication between commissions and affiliates already occurs to some extent. However, without total feedback from commissions and affiliates it is difficult to determine the level of this activity.

Canadian Affiliate, Brian McGarvey has written to me, in response to West's invitation, suggesting that a list of current programmes is published in a special edition of *CI*. This would certainly help affiliates to identify areas of interest and thus relate more directly to the work of the commissions. To

date, lists of current programmes have been published only in the biennial *IUPAC Handbook*. McGarvey's proposal is certainly worth pursuing and I intend to put it forward to the *CI* Editorial Advisory Board when it meets in Lund in August.

Affiliate database

All affiliates have once again been invited to complete blue registration forms and return them to the secretariat in Oxford. In 1988 about 50% of all affiliates responded. The information provided on these forms has been loaded on to a computer database at the secretariat.

A computer print-out with details of each affiliate who has expressed a specific interest in the work of a commission has been sent to that commission together with a letter from Secretary General West encouraging commissions "to consider approaching affiliates to enquire whether their expertise qualifies them to be considered for particular work programmes of your commission".

Furthermore, as West points out in the letter, "in the spirit of trying to increase the participation of affiliates in the activities of the union, the Executive Committee at Moscow (May 1988) recommended to the Bureau, that affiliates from non-member countries (those NOT listed on the inside back cover of this magazine) should be eligible for membership of subcommittees of IUPAC bodies (i.e. working groups/parties, task groups etc). The division presidents, on the assumption that affiliates were able to offer relevant expertise, gave their unanimous support to this recommendation. The recommendation was accepted by the Bureau at its meeting in Oxford (September 1988) and is now effective".

In conclusion, I would point out that one of the original aims of the affiliate membership scheme was to break down barriers between chemists working on IUPAC commissions and committees and those not working on them; in other words to eliminate the "us" and "them" divisions as far as membership of IUPAC was concerned. Although the affiliate membership scheme may have made a slow start in breaking down these barriers it will continue relentlessly to encourage, wherever possible, the involvement of affiliates in the affairs of IUPAC. However, the level of involvement will depend to a large extent on the level of commitment of the commissions and committees towards this aim. Hopefully we will see further steps in this direction at the Lund general assembly — particularly in increased recruitment of affiliates as members of commissions.

Michael Freemantle

News & Views

Ethiopian congress

The 5th Annual Congress of the Chemical Society of Ethiopia was held in Addis Ababa from 12–13 August, 1988. About 300 chemists from universities, colleges, schools, industry and research institutes attended the congress.

The congress was divided into several sessions dealing with industrial chemistry, chemical education, environmental chemistry, clinical chemistry and biochemistry.

Prof. U. Sankawa (University of Tokyo, Japan) presented a plenary lecture on "Biosynthesis of natural products". His participation at the congress was part of the IUPAC Seminars/Visiting Professorships Programme.

In another plenary lecture Dr Tarekegne Yesus, Chairman of the Department of Chemistry, Addis

Prof. Sankawa (right) in discussion with Dr Tarekegne Yesus at the congress in Addis Ababa.

Ababa University, described chemical education programmes at the university. The characteristics and problems of chemical education in Ethiopia were also the subject of a lively panel discussion.

Workshop on analysis of oils and fats

St Andrews University, Scotland, venue of the Workshop on Analysis of Oils and Fats.

An IUPAC-sponsored Workshop on the Analysis of Oils and Fats was held in the Chemistry Department of St Andrews University, Scotland, 23–24 August, 1988 following the 41st meeting of the Commission on Oils, Fats and derivatives (see page 18, January 1989 issue of *CI*).

Over 30 participants from nine countries attended the lectures and participated in the workshop. Prof. Frank Gunstone (St Andrews University) and the commission vice-chairman (the author of this report) co-chaired the workshop.

The workshop covered the most important analytical methods in lipid analysis based on various techniques such as GLC on capillary columns (GLC of fatty acids, trans fatty acids), IR spectrometry (determination of isolated trans unsaturated double bonds). Analytical methods based on HPLC, such as the determination of tocopherols, antioxidants and butyric acid, were also presented.

The second day focused on the determination of sterols by enzymatic methods and capillary GLC and the determination of triglycerides by high-temperature GLC and HPLC. During both days, presentations were followed by demonstrations in the laboratory where participants took an active part.

Abrecht Dieffenbacher

We regret to record the death of:

Prof. Jacqueline Ficini, France (7 December, 1988) — Organic Chemistry Division Committee (1985–1988).

Prof. H. Musso, FRG (20 July, 1988) — Organic Chemistry Division Committee (1975–1981).

Prof. Yu. Ovchinnikov, USSR (17 February, 1988) — Organic Chemistry Division Committee (1971–1975).

Errata

Unfortunately the gremlins have been at work again: a number of errors crept into the January 1989 issue of *CI*.

Dr Peter Nelson has pointed out several in his letter of page 8. For a start, a comma was omitted from the title which should have read "**Name for n, symbol for relative mass**". In the right-hand column of the letter the equation should have

$$M = M^{0} m_r$$

where $M^{0} = 1\ \mathrm{g\,mol^{-1}}$. In the second line from the bottom of the same paragram M^{0} is also incorrectly referred to as M_0.

Finally, the journal referred to twice in reference 2 should have been *Educ. Chem.* and not *J. Chem. Educ.*

Apologies to Dr Nelson and readers for this unnecessary confusion.

Participants at the International Symposium on Surface Chemistry, Adsorption and Chromatography held in Moscow, November, 1988 in memory of A. V. Kiselev. Symposium lectures will be published in the July issue of *Pure and Applied Chemistry*.

Spontaneous combustion in Paris

A demonstration of apparent spontaneous combustion enthralled a crowd of all ages outside the Centre National d'Art de Culture Georges Pompidou ("The Pompidou Centre") in Paris last summer. This was one of many Parisian distractions for participants at the 8th International Symposium on Biotechnology held at the Palais des Congrès in last July. For a full report of the symposium (not the distractions!) see page 92.

Nominations invited for crystallography prize

The International Union of Crystallography invites nominations for the Ewald Prize for outstanding contributions to the science of crystallography.

The prize is named after Prof. Paul P. Ewald, in recognition of his contributions to the foundations of crystallography and to the founding of the International Union of Crystallography. Prof. Ewald was the President of the Provisional International Crystallographic Committee from 1946 to 1948, the first editor of the union's publication *Acta crystallographica* from 1948 to 1959 and the president of the union from 1960 to 1963.

The prize consists of a medal, a certificate and a financial award. It is presented once every three years during the triennial International Congresses of Crystallography. The first presentation of the prize was made at the 14th congress at Perth, Australia, in 1987. The second presentation for which nominations are now being invited, will be made at the 15th congress in Bordeaux, France in July 1990.

Scientists who have made contributions of exceptional distinction to the science of crystallography are eligible for the Ewald Prize, irrespective of nationality, age or experience. No restrictions are placed on the time or the means of publication of the nominee's contributions. The prize may be shared by more than one contributor to the same scientific achievement.

Nominations for the Ewald Prize should be submitted in writing, preferably using the Ewald Prize Nomination Form and accompanied by supporting documentation, to the Executive Secretary of the International Union of Crystallography, 5 Abbey Square, Chester CH1 2HU, UK, from whom copies of the nomination form can be obtained. The closing date for nominations is 31 August, 1989.

Nine million — and growing

The recently published updated Chemical Abstracts Service (CAS) *Statistical Summary* (1907–87) reveals some interesting statistics on the growth of chemical knowledge and the ever-increasing number of chemical substances registered by CAS. At present the total number of substances on file is over 9 million.

In 1966, a mere 313 763 substances were registered during the year on the CAS Chemical Registry System. The number of substances on file at the end of the year was 525 697. Twenty years on — in 1987 — some 610 480 substances were registered over the 12 months bringing the total number of substances of file at the end of the year to 8 694 167.

The phenomenal growth in chemical knowledge this century can be judged by comparing the first and latest volumes of *Chemistry Abstracts*. The first, which appeared in 1907, included a total of 11 847 abstracts on 3074 pages. Eighty years later, in 1987, volumes 106 and 107 contained a total of 476 178 abstracts on 38 268 pages. The 1st *Collective Index* — covering years 1907–16 cited 191 730 documents on a total of 4823 pages. The 11th (and latest) *Collective Index* — covering years 1982–86 — cited 2 812 413 documents on a total of 162 992 pages.

Secretary of Commission on Biotechnology

Dr Lila M. Gierasch has been nominated a titular member and secretary of the Commission on Biotechnology (VI.2). Her address is: Department of Chemistry, University of Delaware, Newark, Delaware 19716, USA. Tel: +1 (302) 451 2739.

Names and Addresses

Full details (names, addresses, telephone/telex/fax numbers) of all commission and committee chairpersons and secretaries and IUPAC officers will be published in *CI* following the Lund general assembly. The following are further changes to the details published in the November 1987 issues of *CI*.

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The land of the thunder bolt

Bhutan is a mountainous country. Valuable minerals have been discovered in its central and southern regions. The country is not well advanced in education: it has two institutes of higher education, 10 high schools and 50 junior high schools. (*Photos courtesy VSO*.)

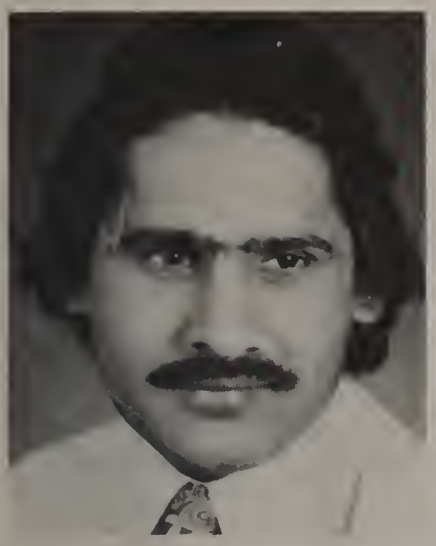
According to IUPAC affiliate Mr J. P. Shukla, the word "Bhutan" means land of the thunder bolt. Bhutan is an independent country bordered by Tibet (China) to the north and India to the south-west and east. It is a mountainous country in the eastern Himalayas with forested hills and deep river valleys. The northern part of Bhutan has high peaks which are always covered with snow.

Shukla is the only IUPAC affiliate in Bhutan. He works as a United Nations Volunteer chemistry teacher at the National Institute of Education, Samchi. His work forms part of the United Nations Development Programme. His main activity is to prepare Bhutaneese teachers for the London University (UK) Bachelor of Education degree and Post-Graduate Certificate in Education.

Before working in Bhutan, Shukla was a senior chemistry teacher for 13 years working for the Indian Ministry of Defence at various military schools in India. He also spent four years as a chemistry teacher in Ethiopia.

Shukla writes that the Bhutaneese people have historically relied on agriculture, livestock rearing and handicrafts for their living. In the past they had a simple, self-sufficient economy. Timber work and other crafts such as leather and woodwork and metal crafts are now developing along with increased employment and production. Bhutan's main exports are horses, cloth, yak hair and salt.

Within the last few years Bhutan, with Indian help, has surveyed its natural resources. In its central and southern regions, valuable minerals have been dis-



Mr J. P. Shukla is an IUPAC affiliate and United Nations Volunteer in Bhutan.

covered: coal in Kalapani and Brandi; dolomite at Kalser; graphite at Chilai pass (Paro); gypsum and anhydrite at Khotakpa; zinc and lead at Genekha; and limestone at Pagli and Paro.

Bhutan's total population is about 900 000. The average density of population is low: about 19 people per square kilometer. Its capital city is Thimphu. Internal communications are poor — often no more than a mule-track. However, in recent years some good roads have been built. Even so, Bhutan is largely cut off from neighbouring lands and receives few foreign visitors.

The country is not well advanced in education. There are two institutes of higher education, one of which offers degrees, the other being a training college. There are about 10 high schools and 50 junior high schools. Almost all of these are residential public schools run on a British style pattern. The language of instruction is English.

Dr Gerard Perreau, Executive Secretary of Société Française de Chimie is National Affiliate Membership Secretary in France. In 1988, 68 French chemists registered as affilitates.

SFC has about 4000 members and is structured into seven divisions and seven groups with 19 regional sections. Its headquarters is in Rue Saint-Jacques, Paris, where Dr Perreau is here pictured reading his favourite English language chemistry magazine!

Affiliates at Paris biotechnology symposium

Mrs Silvia Jimenez (right) was one of several affiliates who attended the 8th International Symposium on Biotechnology held in Paris last year (see page 92). Jimenez is an MSc biochemistry student at the University of Geneva, Switzerland. Her home is in Guatemala City.

Another affiliate who attended the symposium was Miss Boh Bojana (left). She obtained an MSc in biochemistry at the University of Ljubljana, Yugoslavia. She is now working as a research assistant on biotechnology information systems at the UNESCO International Centre for Chemical Studies in Ljubljana.

Letter to the Editor

Affiliate members: outsiders looking in?

Sir,

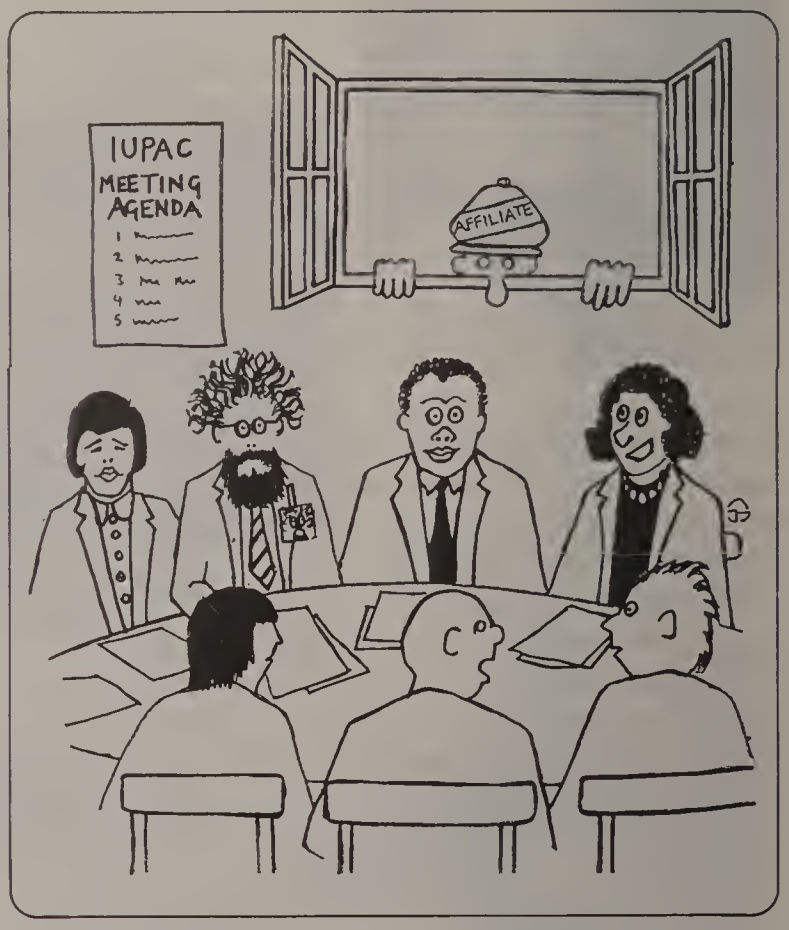
I am writing in response to the question posed by Prof. Tom West in the November 1988 issue of *Chemistry International* (Vol. 10, No. 6, p. 220) regarding the whereabouts of affiliate members.

I became an affiliate member because I thought it would be enjoyable to be involved in IUPAC and perhaps establish contacts not only here in the USA but also overseas. However, I must confess that I am not really sure what being an affiliate member of IUPAC means. I'm sure that when the idea of affiliate membership was first proposed it sounded like a good idea (and I think it still is) but I don't think that the role of affiliate members within IUPAC has been thought through.

I receive *Chemistry International* every two months and enjoy reading most of it (some of it is a little out of my field) but I get the distinct impression of being an outsider looking in.

I'm not sure I have any solutions to the problems posed above but one possible solution may be to establish regional or national affiliate clubs where affiliates can get to know each other either personally or at least through the mail. Would it be possible to include affiliate members in the various IUPAC committees and committees — perhaps as observers? We are not all renowned experts in our fields but inclusion may be a very valuable learning experience.

The American Chemical Society, I think, is also having problems getting its members involved in its activities so it will be even more of a struggle to get



affiliate members involved in an international organization if they don't want to get involved in their own national adhering organization.

Graham W. L. Ellis
Affiliate Member
Benedictine College
Atchison, Kansas, USA

Biotechnology in Paris

The 8th International Biotechnology Symposium took place in Paris in July last year. Over 2000 scientists attended. There were 21 sessions covering topics such as genetics of animal cells protein design, enzymes and organelles, bioreactor technology, vaccines and plant biotechnology. The conference proceedings have recently been published.

The International Biotechnology Symposium takes place every four years. The 5th was held in Berlin (1976), the 6th in London, Canada (1980) and the 7th in New Delhi (1984).

The 8th International Biotechnology Symposium was held at the Palais des Congrés, Paris, 17–22 July, 1988. It was organized by the French Society of Microbiology, in connection with the European Federation of Biotechnology (EFB) and sponsored by IUPAC. About 2200 people from 60 countries registered for the symposium.

The aim of the symposium organizing committee

The registration desk (top right) at the 8th International Symposium on Biotechnology held at the Palais des Congrés (bottom right) in Paris, July 1988.

was three-fold: (1) to present concurrently a scientific and an industrial approach to biotechnology; (2) to offer an opportunity for people in the field of biotechnology to meet in small informal groups; and (3) to publish the proceedings.

Programme

More than 120 invited speakers each gave one-hour lectures on the state of development in their field during the 21 sessions included in the programme. These included lectures on the basic sciences (microbiology, genetics, for example); applications (e.g. medical, agricultural); and general topics (e.g. safety, patents).

There were also a number of round table discussions sponsored and organized by firms, on topics of industrial interest: amino acids; raw materials; protein engineering; structure of proteins; targetting of drugs; biological products for agriculture.

Special attention was paid to developing countries. One full-day session was devoted to biotechnology in developing countries and experts from Africa, South America, Asia and Arab countries had an opportunity to discuss together their particular problems in this field and exchange views for the future.

More than 800 posters presented information on research projects and work in progress in laboratories and gave the opportunity for participants to meet the contributors. There was also an exhibition with about 70 exhibits on materials, reagents, publications and services.

IUPAC and biotechnology

The official IUPAC representative at the symposium was Prof. Manfred Ringpfeil, chairman of the Commission on Biotechnology (VI.2). During the opening ceremony Ringpfeil presented greetings and best wishes on behalf of President Valentin Koptyug and the commission.

Ringpfeil said that biotechnology is growing throughout the world as a new science and key technology. Knowledge of the structure and function of biomacromolecules and regulation of processes in cells and organisms, as well as the discovery and

manipulation of the genetic code have opened new horizons for the practical application of biological systems. New techniques such as genetic and protein engineering, hybridoma technology and cell cultivation have all been developed and applied. In addition, more conventional techniques such as microbial and enzymatic engineering have been improved and applied to health care, agriculture, protection of the environment and industrial manufacture.

Ringpfeil pointed out that IUPAC supports biotechnology with its traditional experience in producing recommendations on nomenclature and symbols, unifying and standardizing analytical methods as well as assessing and recommending procedures: for instance recommendations on the handling of agricultural wastes.

However, IUPAC does not feel that it can cover all aspects of the rapidly developing field of biotechnology. It is therefore cooperating with other international organizations such as COBIOTECH (Scientific Committee for Biotechnology of the International Council of Scientific Unions — ICSU); COGENE (ICSU's Scientific Committee on Genetic Experimentation); as well as the European Federation of Biotechnology and other regional bodies.

"Anything chemists can do — bugs can do better" (comment of a delegate at a recent conference on biotechnology).

Biotechnology 88 — an overview

The opening lecture was given by Prof. François Gros (Institut Pasteur, Paris). In his lecture he asked to what extent is it justified to suggest that biotechnology is entering a new phase of development.

Gros thought that from the scientific and technological standpoints, it is obvious that the very important progress accomplished over the last decade in fields such as enzymology in the solid phase, obtention and amplification of genetic probes by the polymerase chain reaction, as well as expression of transfected genes or even devising new immunological reagents, is beginning to bear fruit. New products are presently appearing on the market, even if some of them are substitutes for more classical ones.

But from now on it is clear that a new generation biotechnology is emerging with the advent of plant molecular biology, protein engineering and sophisticated instrumentation directed towards the analysis, monitoring and production of biological goods.

From another and more general standpoint, the biotechnological revolution, which initially appeared circumscribed by industrialized countries, is presently gaining a new dimension and support in many developing countries.

All this seems to characterize what must be regarded as a true consolidation phase of the biotechnological movement both at the entrepreneurial and socio-political levels. They raise, however, many novel questions in relation to civic regulations, propriety rights and biomedical ethics.

One of the sessions at the Paris symposium was entitled 'Plant biotechnology and its impact on agriculture.'

The creation and exploitation of new proteins

The closing lecture, by Prof. P. Douzou (Institut de Biologie Physico-Chimique, Paris) was entitled "The next step: the creation and exploitation of new proteins".

Douzou explained that, so far, genetic engineering has mainly been used to produce substances that

already exist, through implanting the genes controlling production of proteins into bacteria which then produce these proteins. However, the next big step will certainly be the creation of proteins by protein engineering.

The gene encoding the protein is first cloned into a vector from which the protein is expressed and is then mutated *in vitro* to change a particular nucleotide and hence the amino acid sequence of the protein, in order to improve the properties involved in the existing processes.

The design of more radical changes in proteins, however, is not yet routine because of our ignorance of the fundamental laws governing protein folding into three-dimensional structure and the *structure–activity* relationships. Without the ability to predict folding and to understand the complex interplay of internal forces arising from folding, biochemists cannot yet create desired proteins to meet human needs.

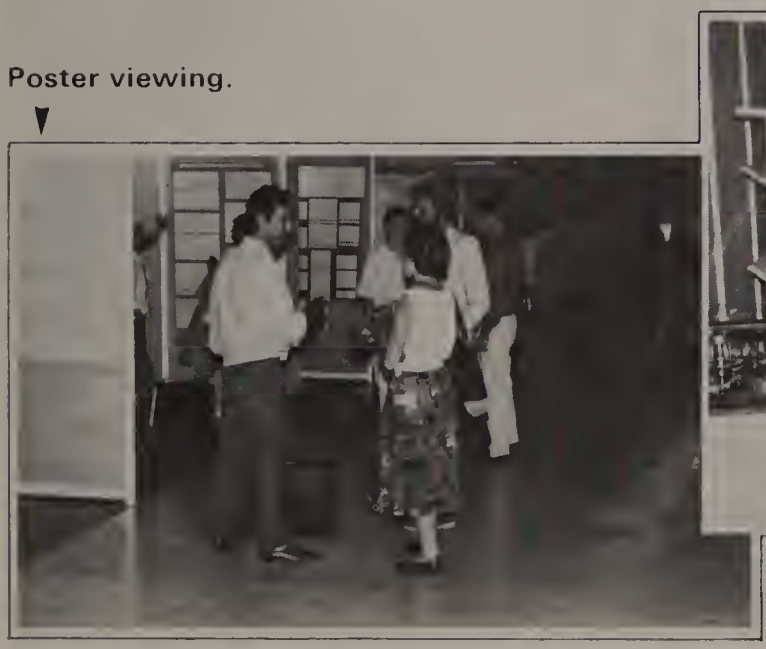
Basic research must now be orientated in new directions to provide these prerequisites. Douzou described and discussed an approach considering globular proteins as hydrated polymer networks with a gel-like cortex. He showed that this model explains a number of experimental facts uninterpretable in a different context and suggests the nature of the driving force of protein function. The model should permit the investigation of basic *structure–activity* relationships and establish new guidelines for protein engineering.

9th Symposium

The 9th International Symposium of Biotechnology will take place in Washington DC, USA in 1992.

Prof. Manfred Ringpfeil, chairman of the Commission on Biotechnology, presenting the greetings of the Union at the opening ceremony.

Participants from 60 countries attended the symposium.



Poster viewing.

One of the exhibits.

Biotechnology experts from around the world gathered at the Paris symposium

Prof. S. Fukui (Japan). ►

◄ Dr L. V. "Ram" Venkataraman (India) presented a lecture on "Production of food, feed and molecules by algae" in the session on recent progress in food and feed biotechnology.

▲ Dr Dahan Alani (Saudi Arabia) was a member of the Honorary Committee of the symposium.

▲ Dr Haryanto Dhanutirto (Indonesia) was a member of the Honorary Committee of the symposium.

Prof. D. I. C. Wang (USA) announced that the 9th International Symposium on Biotechnology will take place in Washington D.C. in 1992. ►

Commission & Committee News

Standard quantities in chemical thermodynamics

The Commission on Thermodynamics (I.2) held its annual meeting in Prague, Czechoslovakia, on 27 August, 1988. The meeting was held in conjunction with a successful IUPAC-sponsored Conference on Chemical Thermodynamics.

Attendance at the commission meeting was good, especially by associate members and national representatives. The approval of a document and reviews of tentative projects were the main topics on the agenda.

The commission approved the document dealing with definitions of activities and related quantities that has been under preparation under varying titles for five years. The present title is "Standard quantities in chemical thermodynamics: fugacities, activities and equilibrium constants in pure and mixed phases". The aim is to publish this as a IUPAC document complementing *Quantities, units and symbols in physical chemistry* (The Green Book).

The commission approved the report of the feasibility study on "Definitions used in dilute solutions including electrolytes" and suggested that the working party, chaired by J. Barthel, prepare a project proposal to be presented at the general assembly in August 1989.

K. N. Marsh and P. A. G. O'Hare reported that the response to their enquiry about the preparation of Volume 3 of *Experimental Thermodynamics* dealing with solution calorimetry had been encouraging and they presented a preliminary list of topics and authors. The commission suggested that Marsh and O'Hare continue their work and prepare a project proposal to be presented at the general assembly.

Only lukewarm interest was shown in response to an enquiry about the publication of a new *Thermodynamics Newsletter*. Only 89 answers were received to 2000 letters mailed by Marsh. The commission concluded that there is no economic base at the present for the publication of such a newsletter.

Gerd Olofsson

Nomenclature of organic chemistry

The Commission on Nomenclature of Organic Chemistry (III.1, CNOC) met in Zürich, Switzerland, 15–19 August, 1988 for its annual working session. The general theme of the commission's work is the publication of recommendations that would produce preferred unique names for individual compounds, to remove the many inconsistencies and gaps in current recommendations, and to provide more comprehensive documentation of current practices.

The importance of having a single, systematically logical name for each compound has increased as the number of known compounds has grown, and has

The Prague Institute of Chemical Technology was the venue of the 10th International Conference on Chemical Thermodynamics and the 1988 meeting of the Commission on Thermodynamics.

become more pressing as the use of the computer in the storage and retrieval of information has increased. The commission is very aware of its responsibility for adapting nomenclature to meet the needs of modern information processing and retrieval.

Accordingly, some of the principles, and the documents that embody them, that have served organic chemists reasonably well since the benchmark Geneva Conference of 1892, are no longer adequate, and must be painstakingly re-examined and revised. Nevertheless, the commission noted that the value of the existing IUPAC recommendations remains high, as attested by the recent publication of two major translations of them (into Dutch and Spanish) by national organizations.

Before getting down to the work itself, the commission spent some time discussing how its role should evolve to meet the changing needs of chemists, and what its response should be to the proposal from the Organic Division Committee for restructuring the division's commissions. Members felt that the matter was in need of much constructive dialogue, for neither the division committee nor its "Forward activity planning group" had direct experience of the work of the commission. The commission therefore discussed ways to deal with this unfortunate lapse in communication at the forthcoming meeting in Lund.

Major projects

A major part of the commission's attention in Zurich was taken up by a near final critique of "A guide to the use of IUPAC nomenclature of organic compounds", a book-length document that has been in gestation for several years, and the responses of the referees who had reviewed it. It was then approved for submission by IDCNS (Interdivisional Committee on Nomenclature and Symbols).

Another major object of attention was the project "Revised nomenclature for radicals, ions, radical ions, and related species". The responses received from five of the eighteen reviewers to whom the 1987 draft had been sent were discussed and a few further revisions were made. Although some points still remain unsettled (such as the nomenclature of carbenes), the document was approved for submission to IDCNS. The responses from IDCNS and public review will, it is hoped, make it possible to resolve the remaining problems to everyone's satisfaction.

Two extensive projects are just one step behind the foregoing projects. The June 1988 draft of the glossary "Class names in organic chemistry based on structure" was reviewed and plans were confirmed for achieving a consistent style for the many definitions. It is hoped that the resulting revised draft may be ready for submission to referees in 1989.

"Nomenclature for fused and bridged-fused ring systems", a project dealing with the complexities of selecting a preferred name and of orienting and numbering such ring systems, should also be ready for peer review in 1989.

"Natural products are a special case for nomenclature, for it is often desirable to provide names implying complex stereochemistry even before their structures are fully known."

Natural products are a special case for nomenclature, for it is often desirable to provide names implying complex stereochemistry even before their structures are fully known. A revised (and naturally, expanded) treatment of this problem, known as "Section F", was presented by P. M. Giles, Jr for discussion.

Ted Godly's paper on "Principles of preferred name construction using substitutive nomenclature" addressed the question of seniority of different classes of compounds.

The commission then turned to some more narrowly focused topics beginning with a paper by Ted Godly, "Principles of preferred name construction using substitutive nomenclature". This paper was largely addressed to the question of seniority of different classes of compounds (e.g. "4-formylphthalic anhydride" or "1,3-dioxo-1,3-dihydro-2-benzofuran-5-carbaldehyde"?).

Another paper, by Oskar Weissbach, "The non-equivalence of the operations of suffix group attachment and substitution", was of more practical importance than its abstruse title might indicate. It dealt in part with the problem of "hydro" prefixes in names and their relation to ring numbering.

The project "Nomenclature of cyclophanes" has had an unusually long history, in part because the scope and complexity of the subject were not fully realized until the subject had been elaborated to a substantial degree. As a result of comments by peer reviewers, an earlier draft had to be substantially rewritten. The latest draft, which the commission took up in Zürich, is to be resubmitted to the same reviewers. It is expected that this document will be ready for submission to IDCNS at the end of 1989.

Projects nearing completion

Two other projects have matured to the point that formal documents may soon be ready for detailed consideration and peer review. These projects are "Acid nomenclature", which deals with both prefix and suffix nomenclature for a confusing array of acid functions (and their derivatives) centred on sulfur, phosphorus, and nitrogen as well as carbon, and "Stereochemical nomenclature", which will be a comprehensive revision of Section E of the current rules. The latter is now ready to go ahead, following completion of the glossary of stereochemical terminology (a joint project of CNOC and the Commissions on Physical Organic Chemistry (III.2), Nomenclature of Inorganic Chemistry (II.2) and Macromolecular Nomenclature (IV.1).

With so many projects nearing completion, the commission expects soon to be able to dissolve the several working parties responsible to them, and thereby have the resources to proceed with projects that have so far received only limited attention.

Among these are "Principles of preferred name construction", a rational modification, and, where necessary, elaboration of the principles needed for generation of a unique name for any compound, "New principles", in which innovative methods for specifying structures in words or symbols are generated and considered, and an examination of the means by which electronic handling of data can interact most productively with traditional nomenclature.

Plans to celebrate the centennial of the 1892 Geneva Convention at an international level in 1992, appropriately in Geneva, are underway.

Peter A. S. Smith

Summit meeting (from left): Prof. N. M. Bahzin (USSR), Dr Richard Brown (UK), Prof. Peter Warneck (FRG) and Dr Sjaak Slanina (Netherlands) at the mountain station of the Fraunhofer Institute for Atmospheric Environmental Research. The station is located in the northern part of the German Alps near Garmisch-Partenkirchen.

Global atmospheric chemistry

Since the last meeting in Boston, USA, the Commission on Atmospheric Chemistry (VI.4) has expanded and members from China, Japan and USSR were present at the meeting held in Munich, FRG, 5–7 September, 1988. Contributions from these countries were welcomed in view of the current awareness of the global atmospheric chemistry problems.

The commission decided to pursue a new range of activities. These will deal with recent developments regarding global problems, such as global climatic changes caused by atmospheric trace gases and depletion of stratospheric ozone.

Good progress has been made on the following projects:

- Glossary of terms in atmospheric chemistry
- Inventory of tropospheric sampling networks
- Evaluation and recommendation of units for use in atmospheric chemistry.

Following a final round of written comments, papers on these projects will be submitted for review.

Starts have been made on two other projects:

- Review of analytical methods for the measurement of contaminants in the workplace.
- Evaluation and compilation of Henry's Law constants as related to atmospheric chemistry.

Other projects, due to start in the near future, were also discussed. One of these is concerned with a world-wide inventory of emissions. The success of this project will largely depend on obtaining emission data from regions throughout the world.

The first subcommission of Commission VI.4 has been formed. The subcommission is concerned with tropospheric networks and will meet for the first time at the Lund general assembly. It has already been active in formulating the report of the inventory of tropospheric sampling networks.

Commission VI.4 discussed plans for the CHEMRAWN conference on atmospheric chemistry. The commission will offer every possible cooperation and has suggested a general theme: to approach atmospheric chemistry as one coherent system of reactions leading to different effects such as acid deposition, the oxidant problem, the arctic ozone hole and global climatic changes. Close contacts with the CHEMRAWN Committee will be maintained.

The meeting closed with a visit to the Fraunhofer Institut für Umweltforschung. Its director, Prof. Wolfgang Seiler, showed the commission the measurement stations, installed on the Zugspitze. These stations monitor global atmospheric changes.

J. Slanina

Pesticide chemistry workshop in China

A workshop, arranged by Nankai University and involving scientists from the Commission on Agrochemicals (VI.4) and from many parts of China, was held in Tianjin from 26–28 August, 1988. The workshop was attended by about 100 chemists and was a great success.

The workshop was opened by Prof. Zhengming Li of Nankai University and by commission chairman Dr R. Hemingway. Prof. Mu, President of Nankai University welcomed participants and offered good wishes for the success of the meeting. Finally, Mr Qiu Xibai, Executive Secretary of the Chinese Chemical Society, read a letter of welcome.

At the opening ceremony (from left): Mr Qiu Xibai (Chinese Chemical Society); Dr R. J. Hemingway (Chairman, Agrochemicals Commission); Prof. Mu Guoguang (President, Nankai University); and Prof. Zhengming Li (Department of Elemento-organic chemistry, Nankai University). Prof. Fan Defang, Zhejiang Agricultural University Hangzbou, (above) lecturing on residue analysis in China.

The scientific programme opened with general papers on the following topics:

- Advances in pesticide science (J. Miyamoto)
- Safe use of pesticides (E. Dorn and Xue Shouzheng)
- International registration of pesticides (R. Hemingway)
- Herbicide use in China (Hu Xiaoxing)

These were complemented later by an outline by Dr D. B. Sharp of the steps involved in developing a new pesticide. The remainder of the workshop covered residue analysis, metabolism, environmental fate and monitoring, synthesis and bioactivity of novel chemicals and structure–activity relationships.

The contributions on residue work covered methodology and data. Prof. Fan Defang described residue analysis work in China from 1960 to the present including the use of multi-residue methods. Dr P. T. Holland summarized the state of mass spectrometry as applied to residue analysis and Dr T. Roberts described the use of immunoassay as a screening tool for pesticide residues in environmental samples. A number of topics in the metabolism area were of particular interest. Drs B. Donzel and G. D. Paulson covered plant and animal studies, respectively, including both the types of study needed for registration and those designed to gain a better understanding of mechanisms, and Prof. N. Kurihara described the use of stable isotopes as alternatives (or complements) to radiolabels.

Several contributions were presented by IUPAC and Chinese chemists on the behaviour of pesticides in soil and water, a topic of particular interest world-wide. Prof. W. Klein gave a broad paper on environmental fate and more specialized papers covered microbial degradation of pesticides. Prof. L. A. Golovleva's overview described the role of micro-organisms in

Some of the participants at the workshop (above). Prof. R. M. Hollingworth (titular member of the commission) presenting a lecture.

bioconversion of pesticides, and Dr N. Aharonson described work on the accelerated degradation recently observed with several pesticides and the problems caused by loss of efficiency. Contributions from Prof. Liang, Mr Zhuang, Dr Otto and Dr Vonk on soil and water behaviour emphasized the extent of work on these topics currently taking place in many institutes. Finally, the developing use of simulation models for assessing environmental fate was reviewed by Dr Wauchope.

Synthesis of chemicals hopefully with pesticidal activity was being carried out at several locations in China. Profs Li and Hu gave papers respectively on synthesis of peptide pesticides and on enantio-selective synthesis of chrysanthemic acid and several other papers dealt with isolation and characterization of naturally occurring bioactive molecules.

Outside the area of pesticides, Dr R. Greenhalgh presented a paper on control of fusarium diseases in cereals and characterization of secondary metabolites.

The three-day workshop resulted in very useful contacts between scientists with similar or with complementary interests. The experience shared by visiting scientists of the complex range of studies needed to develop and register a new pesticide as well as understand its behaviour in the environment, was clearly of interest to the Chinese chemists involved in discovering potential new pesticides. A closer knowledge of the research programmes in Chinese universities and institutes was also gained by the visitors and many contacts made will be followed up.

The workshop was extremely well organized by the hosts from Nankai University. In addition, they arranged an excellent, most enjoyable social programme including a visit to a traditional Chinese theatre and a series of delicious Chinese banquet meals.

Terry Roberts

Teaching of clinical chemistry

The final meeting of the Commission on Teaching of Clinical Chemistry Division was held in Hong Kong, as part of the 4th Asian Pacific Congress of Clinical Biochemists. The main business of the meeting was to summarize the progress of the commission's various projects which it was anticipated would be completed by the end of 1988 when the commission was dissolved:

- *Preparation of reference catalogue of audio visual and bibliographic material for the teaching of clinical chemistry*. A provisional draft computer file of bibliography has been prepared. This will be available for circulation through the International Federation of Clinical Chemistry (IFCC) Secretariat. This work will continue under the auspice of the IFCC Education Division.
- *Drug effects in clinical chemistry; Education Aspects*. This work has been carried out in collaboration with the IFCC Panel on Drug Effects in Clinical Chemistry and a paper has been submitted for consideration for publication.
- *The clinical chemist's role in laboratory safety*. This project has been completed and a manuscript submitted for consideration for publication.
- *Guidelines for the preparation of laboratory procedure manuals for clinical chemistry*. This project has been completed and its conclusions published (*J. Clin. Chem. Clin. Biochem.*, **26**, pp. 415–419, 1988; *Bioquimica Clinica*, **12**, pp. 967–971, 1988).
- *Syllabus for clinical chemistry training in laboratory management*. This project is near completion and a manuscript will shortly be submitted for consideration for publication.
- *Guidelines for production of objectives based syllabi for clinical chemistry*. This project has been completed and a paper published (*J. Clin. Chem. Clin. Biochem.*, **26**, pp. 163–167, 1988).
- *Guidelines for introductory teaching of clinical chemistry*. This project has been completed and a short article on "Should clinical chemistry be taught in schools?" published in the *International Newsletter on Chemical Education*, **27**, pp. 15–17, 1987.

Howard Worth

Provisional Recommendations

IUPAC seeks your comments

All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* (*PAC*) and synopses of these published in *CI* as recent reports. If you would like to comment on the provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the IUPAC Secretariat. The most up-to-date list of national/regional centres appeared in *CI*, Vol. 11, No. 2, p. 67, 1989.

Classification of analysers in clinical chemistry

The classification scheme suggested should be helpful in making understandable the various concepts of mechanized and automated analytical systems. It should be used as a guide for teaching automation in clinical chemistry, and as a base for describing new instrumentation by manufacturers and professionals.

A mechanized analytical system comprises an analyser and the reagents required to perform a specified analysis. The term analyser is similar to a measuring system which is defined as a complete set of measuring instruments and other equipment assembled to carry out a specified measured task.

Usually analytical systems are classified according to the principle of their transport system, for example, discrete and flow procedures. In the document a further subdivision is achieved by considering methodology, number of tests, sampling and processing procedures or test selection. Common examples are included in scheme presented.

Comments on the classification should be sent before 31 December, 1989 to: Prof. R. Haeckel, Institut für Laboratoriumsmedizin, Zentralkrankenhause St Jergenstrasse, D-2800 Bremen 1, Federal Republic of Germany.

Proposals for the description and measurement of carry-over effects in clinical chemistry

Carry-over phenomena occur both in manual and mechanized procedures and are often neglected in practice. Even with the latest development of clinical chemistry analysers carry-over phenomena are observed. This paper makes recommendations concerning the terminology of carry-over and its classification. The conceptual aspects of specimen-dependent and specimen-independent carry-over are outlined, and both the experimental determination and calculation of carry-over effects are described in detail.

The term carry-over is commonly used to describe a process by which materials are carried into a reaction mixture to which they do not belong. These materials can be either parts of a specimen, or reagents including the diluent or wash solution. In such cases, carry-over means the transfer of material (specimen or reagents) from one container, or from one reaction mixture, to another one. It can be either unidirectional or bidirectional in a series of specimens or assays.

Carry-over effects should be expressed rather in units (e.g. in mol l^{-1} or U l^{-1}) which are used to present the results than as quantity fractions. This concept of presenting carry-over effects as a difference of two results or its corresponding percentage value has two advantages: it is applicable to all conditions which at present are encountered in practice and it directly provides information on how much a particular result deviates from its correct value which is obtained in the absence of carry-over effects.

Comments on these proposals should be sent before 31 December, 1989 to: Prof. R. Haeckel, Institut für Laboratoriumsmedizin, Zentralkrankenhaus St Jergenstrasse, D-2800 Bremen 1, Federal Republic of Germany.

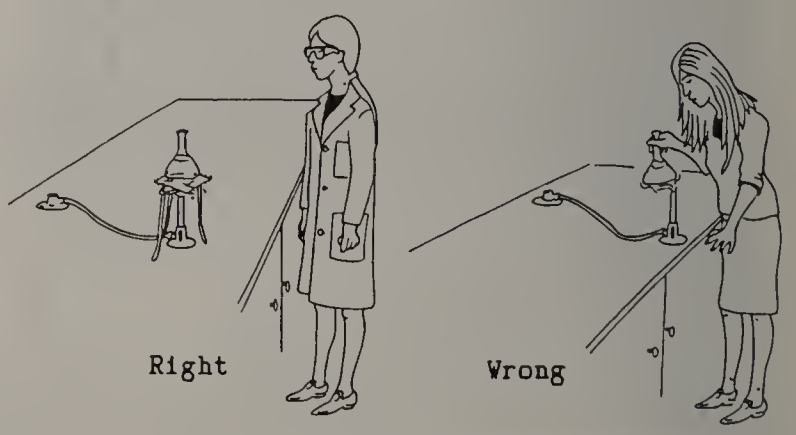
Publications

Safety in the school laboratory

The June 1988 issue (No. 29) of the *International Newsletter on Chemical Education* is a special issue on safety in schools and No. 1 of the IUPAC–CTC (Committee on Teaching of Chemistry) monographs on chemical education.

The following are some of the key points highlighted in this issue:

1. Follow strictly all directives or codes of practice set down by the school controlling authority. A teacher must always, in the first instance, know and observe the requirements laid down locally.
2. Use only modern books or laboratory manuals for details of practical work.
3. Accept that there are no absolute standards of safety.
4. Assume that, even with up-to-date information, unrecognized hazards will occur.



One of the illustrations in the special issue of *International Newsletter on Chemical Education* on "Safety in Schools".

5. Get medical help immediately an accident occurs unless you are certain there is no further hazard to the students involved.
6. Put some responsibility on the students themselves.
7. Exemplary safety practices must be observed at public demonstrations and open days.

Precautions

- Safety spectacles or goggles should be worn during all practical activity and when any work is occurring in the laboratory, if the school can possibly afford to purchase them.
- If a chemical gets in the eye do not rub it. Wash it with a gentle flow of cold water for at least 15 minutes.
- Poisonous gases such as chlorine must be prepared and handled in a fume cupboard or in the open air.
- Wash off *with cold water* any chemical accidentally spilled on the body.
- For chemical burns: flood the affected part with cold water. Remove all contaminated clothing to prevent continued exposure. Get medical assistance.
- For burns and scalds: cool the burn as rapidly as possible with cold water and keep immersed in cold water for 10 minutes. This will reduce the pain, also the effects of the burn.
- Burning clothing should be smothered with a blanket or other clothing immediately, or by rolling on the floor. Be careful of the "chimney effect" if someone is wrapped in a blanket while standing. Flames and toxic fumes may be directed at the face.
- In the event of electric shock, first switch off the supply. If the person is unconscious, use the Expired Air method of rescue breathing to revive him/her.

Expired Air technique

All school programmes should include a short course in the Expired Air technique for every teacher and senior student:

- Clear throat of any obstruction
- Tilt head right back
- Pull chin forward to keep tongue clear of throat
- Blow air through nose or mouth till chest rises (if blowing through nose close vicitim's mouth, or vice versa)
- Listen. Snoring or gurgling indicates throat obstruction.
- Repeat 10 to 15 times per minute for up to 2 hours. Make the first 10 breaths deep, rapid but not forceful.
- CALL FOR MEDICAL HELP

In a number of countries mouth pipetting has been completely abandoned. It is highly recommended that students be trained in the use of syringe fillers or heat pipettes.

If a reliable pipette filler is not available and a mouth pipette must be used, then the pipetting of all organic compounds including solvents, corrosive liquids, hot solutions, known poisons and biological samples, e.g. blood serum, urine etc. should be prohibited.

As a general rule there should be no mouth pipetting of any solution in concentration greater than 0.1 mol dm^{-3}. (*Photo courtesy UNESCO/Mireille Vautier.*)

- Fires: immediately evacuate students unless the fire is very small and the teacher is completely confident it can be easily extinguished.
- Do not mix solid or highly concentrated oxidizing or reducing agents.
- Use safety screens to protect both teacher and students whenever there is the possible risk of implosion or explosion.
- Obey the policy of the Education Authority for the safe packing and disposal of such materials.

Polymer for biosystems

Seventy million tons of polymers, valued at over 140 billion dollars were produced world-wide in 1986. The bulk of this production was relatively simple commodity polymers. Recently, however, a small but growing proportion of the polymers produced were specially designed and tailor-made for specific, increasingly sophisticated applications.

These achievements in polymer science led to a recent statement by Prof. Herman Mark that the time is close when "the potential of polymer chemistry will be limited only by the imagination and ingenuity of scientists".

CHEMRAWN Committee member Joachim Klein who presented a paper on "Polymers as matrices for whole cell immobilization" at the Jerusalem symposium.

It appeared to the organizers of the 1987 International Symposium on Polymers for Advanced Technologies that the time was ripe for focusing the attention of scientists from academia and industry on recent developments and on several new aspects of polymer research and its impact on the emerging science-based technologies, in order to meet the challenges of the 21st century.

The symposium took place in Jerusalem, 16–21 August, 1987 with 450 participants from 20 countries. The programme consisted of 26 lecture sessions, 2 poster sessions and a panel discussion on strategies for advanced polymers in the world.

The opening lecture by Herman Mark presented an overview on polymers for advanced technologies. This was followed by plenary lectures by Prof. E. Katchalski-Katzir on "Recent advances in the study of biopolymers"; by Nobel Laureate Prof. Bruce Merrifield on "Solid phase peptide synthesis after 25 years: The design and synthesis of antagonists of glucagon"; by Dr D. Tanner on "Polymers for advanced structures"; and by Prof. A. Chapiro on "Polymers in radiation-related technologies".

The symposium, organized by Prof. Menachem Lewin, was the 3rd IUPAC-sponsored macromolecular symposium held in Israel. The first took place in Rehovot in 1956 and the second in Jerusalem in 1975.

The scientific programme was organized around three major topics (microsymposia):

- polymers for biosystems
- polymers in radiation-related technologies
- polymers for advanced structures

Volume 19 of *Makromol. Chem., Macromol. Symp.* (1988) contains presentations from the first of these topics. The main areas covered are polymers as matrices for biological synthesis, polymers for biosensors, polymers for bioseparation, biocompatible polymers in medical applications and polymers as drugs carriers.

Clinical chemistry documents

The following three proposed documents have been prepared and circulated by the Scientific Division's Committee on pH, blood gases and electrolytes (SD-CBGE) of the International Federation of Clinical Chemistry (IFCC):

- IFCC Document, Stage 1, Draft 3, 1988-11-01. Guidelines for routine measurement of blood haemoglobin oxygen affinity.
- IFCC Document, Stage 1, Draft 8, 1988-11-15. Recommendation on blood sampling, transport and storage for the determination of the substance concentration of ionized calcium.
- IFCC Document, Stage 1, Draft 5, 1988-12-20. Definitions of quantities and conventions related to blood pH and gas analysis.

All written comments received before 1989-06-01 will be reviewed at the next meeting of the SD-CBGE in Triuggio-Monza (Milan), 20–26 June, 1989. The outcome of this consultation, together with new drafts (Stage 2), will then be reported to the IFCC Scientific Division.

Further information from: Dr P. D. Wimberley, Department of Clinical Chemistry, Gentofte Hospital, Niels Andersensvej 65, 2900 Hellerup, Denmark.

Solubility Data Series

The IUPAC *Solubility Data Series* contains critically evaluated solubility data for physical and biological systems. Volumes 31 to 38 have recently been published.

Alkali metal orthophosphates

Alkali metal orthophosphates is Volume 31 of the *Solubility Data Series*. It presents and evaluates the water solubility data for the orthophosphates of lithium, sodium, potassium, rubidium and caesium. In addition to this, some data for the solubility of sodium metaphosphate and solubility values for the NH_3-K_2O-H_3PO_4-$H_4P_2O_7$-H_2O system are included.

Most of the available solubility data are for the or-

IUPAC affiliate Thedford P. Dirkse (left) who is one of the editors of Volume 31 of the *Solubility Data Series*. Mark Solomon (right) was one of the contributors to this volume.

thophosphates of sodium and potassium. For these two systems an introductory chapter on the MOH–H_3PO_4 (M = Na or K) system is given. Following each of these introductory chapters there are chapters dealing with the solubility data for individual phosphates having different M/P ratios, and the ternary and multicomponent systems in which these phosphates are components.

The literature for all systems has been covered up to 1984. The critical evaluation of the data made it possible to define sets of recommended solubility values for KH_2PO_4 and $NaH_2PO_4.2H_2O$ and tentative solubility values for the other phosphates under consideration.

Contents include: solubility of solids in liquids; lithium phosphate; the Na_2O-P_2O_5-H_2O system; sodium dihydrogenphosphate; disodium hydrogen phosphate; trisodium phosphate; the K_2O-P_2O_5-H_2O system; potassium dihydrogenphosphate; dipotassium hydrogenphosphate; tripotassium phosphate; rubidium dihydrogenphosphate; caesium dihydrogenphosphate.

Volume 31 of the Solubility Data Series *is edited by Jitka Eysseltovà and Thedford P. Dirkse and published by Pergamon Press, Oxford, UK, 1988. xx + 348 pp. ISBN 0 08 035937X. Price USD 120.00.*

Hydrogen sulfide, deuterium sulfide and hydrogen selenide

Volume 32 of the *Solubility Data Series* contains data published prior to January 1987 on the solubility of hydrogen sulfide, deuterium sulfide and hydrogen selenide in pure water, in aqueous solutions containing other components and in organic solvents.

Published solubilities of these gases have been tabulated and evaluated and the recommended data are indicated. Where appropriate, recommended expressions giving mole fraction solubilities at a partial

Peter G. T. Fogg (left) was one of the editors of Volume 32 of the *Solubility Data Series*. H. Lawrence Clever (right) was one of the contributors to this volume.

pressure of 1.013 bar as a function of temperature are given.

The bulk of the volume is devoted to hydrogen sulfide because very little data for deuterium sulfide and for hydrogen selenide have been published. Many of the solvents for which data are given are used to remove hydrogen sulfide in industrial desulfurization processes. Dissolution of hydrogen sulfide in some solvents has been studied under elevated pressure and all the available high-pressure solubility data are tabulated.

Several charged and uncharged species exist in equilibrium when hydrogen sulfide is in contact with aqueous solutions of ammonia and of alkanolamines. The number of species is increased if carbon dioxide is also present. Solubility data for these industrially important systems are also included.

The book will be of interest to inorganic, physical and organic chemists and to chemical engineers. It has a special relevance to the control of pollution.

Contents include: the solubility of gases in liquids; hydrogen sulfide in aqueous solvents (water; solutions of weak or non-electrolytes; solutions of strong electrolytes; sea-water; solutions of ammonia; solutions of alkanolamines); hydrogen sulfide in non-aqueous solvents (critical evaluation of data; hydrocarbons; alcohols; ethers and polyglycols; other compounds of carbon; hydrogen and oxygen; compounds containing silicon; compounds containing halogen; compounds containing nitrogen; compounds containing sulfur; compounds containing phosphorus); deuterium sulfide in deuterium oxide; hydrogen selenide in aqueous and non-aqueous solvents.

Volume 32 of the Solubility Data Series *is edited by P. G. T. Fogg and C. L. Young and published by Pergamon Press, Oxford, UK, xvi + 352 pp. ISBN 0 08 0324819. Price USD 120.00.*

Molten alkali metal alkanoates

Molten alkali metal alkanoates is Volume 33 of the *Solubility Data Series*. Most alkali metal alkanoates exhibit polymorphism in the solid state. However, controversy exists about the number, nature and stability range of the polymorphs present in a given solvent. This volume discusses all available solubility data for the title compounds, and includes critical evaluations for all systems considered.

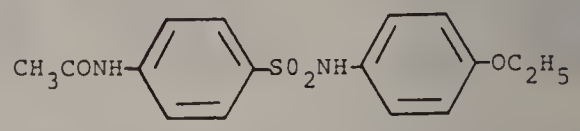
The book is intended for inorganic and analytical chemists, and chemical engineers.

Contents include: introduction to the solubility of solids in liquids; systems with common anion; systems with common cation.

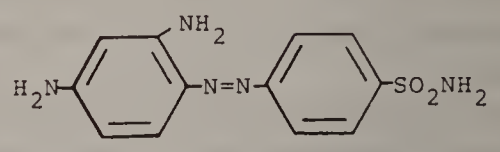
Volume 33 of the Solubility Data Series *is edited by Paolo Franzosini (co-editors: Paolo Ferloni, Alberto Schiraldi, Giorgio Spinolo) and published by Pergamon Press, Oxford, UK, 1988. xxxiv + 348 pp. ISBN 0 08 032522X. Price USD 120.00.*

4-Aminobenzenesulfonamides

With few exceptions, volumes 34, 35 and 36 of the *Solubility Data Series* deal with solubilities of the derivatives of 4-aminobenzenesulfonamide, usually referred to as "sulfanilamide" (sulfanilic acid amide), a name coined in 1937. The history of sulfanilamide begins in 1906, when Schroeter synthesized the molecules containing a 4-acetylaminosulfanilamide portion.



In 1908, Gelmo described sulfanilamide and 13 of its derivatives and gave solubility values for these compounds. In 1935, Domagk detected antibacterial activity of a synthetic azo dye, prontosil, with the structure:



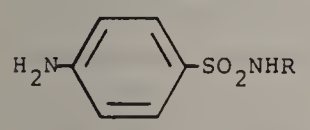
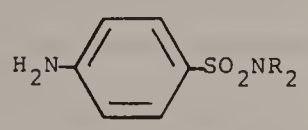
This compound had been tested for antibacterial activity, the "sulfanilamide" portion being responsible for its activity. This was confirmed by isolation of sulfanilamide in the urine of patients. Fildes and Wood, in 1940, demonstrated that the derivatives of sulfanilamide were antimetabolities of p-aminobenzoic acid (PABA) which is a step in the folic acid synthesis of bacteria. Thus, the structural similarity of PABA and sulfonamides caused interference by competitive antagonism and resulted in a bacterio-static effect. The discoveries of antibacterial activity led to an exciting flood of research, and thousands of sulfanilamide derivatives have been synthesized. As early as 1948, the number of sulfonamide derivatives was estimated to be several thousand. In the two decades after that, the number of synthesized sulfonamides has gone past 10 000.

Clinical trials of these sulfonamides and derivatives have been associated with low solubilities and some renal crystalluria. The low solubility, and its sensitivity to pH, could cause crystalline precipitation in the renal tubules in the filtration of blood into acidic urine. Some of the problems of limited solubility were overcome by complexation or salt formation, and solid state manipulations which in turn have stimulated investigations into solubility of the drugs in water, buffers and some binary solvent system. Analytical methodologies span a wide spectrum of techniques and the relevant references are in pharmaceutical, medical and chemical literature.

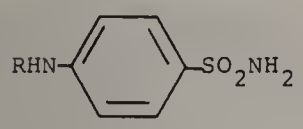
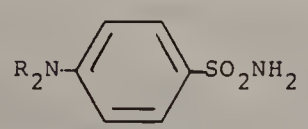
In all volumes the chemical structures, registry number and the molecular weight of the compounds considered are collected in the front of each volume. The compounds as they occur on the data sheets are given successively in each volume. In the first volume of this series there are 35 compounds. The second and third volumes have 58 compounds and 108 compounds, respectively.

Nomenclature

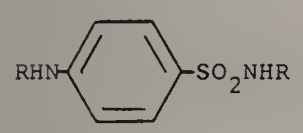
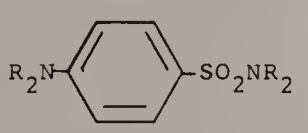
The nomenclature of sulfanilamide derivatives has conventionally been based on the following numbering system: substituents at the nitrogen atom of the amide group ($-SO_2NH_2$) are called N^1-substituents, whereas substituents at the 4-amino nitrogen ($4-H_2N-$) are called N^4-substituents. Substitution in either or both of the two positions lead to compounds referred to as "sulfonamides" (sometimes "sulfanilamides" or even "sulfamides"). Here are illustrative examples of this nomenclature.

N^1-substituted sulfonamides

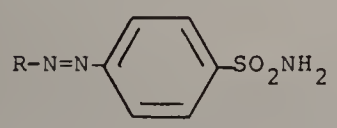



N^4-substituted sulfonamides

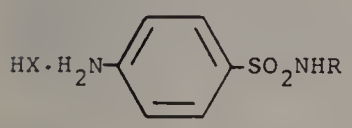
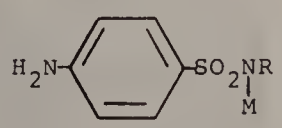



N^1,N^4-substituted sulfonamides

The 4-amino group can be diazotized to give derivatives of the formula



As the sulfonamide molecule carries a basic $4-NH_2$ group and an acid $-SO_2NH_2$ one, it is capable of forming the respective salts or complexes, for example,

where HX stands for an acid and M is a univalent metal atom.

In common use by health practitioners are non-proprietary names of sulfonamides which are brief and reflect the chemical nature of their molecules. Examples are: sulfacetamide, sulfapyridine, sulfathiazole, sulfadiazine, sulfaguanidine, etc. There are numerous trivial names; for example, sulfanilamide has as many as 140 synonyms, and sulfathiazole has 113. Negwer has compiled an excellent guide to this nomenclature. In chemical literature, systematic names in line either with IUPAC or Chemical Abstract rules are used. The latter has been adopted in these volumes and the systematic name is, where appropriate, followed by non-proprietary or trivial name.

Organization of the volumes

The numerical data on the solubility of 2-aminobenzenesulfonamide, 3-aminobenzenesulfonamide, and 4-aminobenzenesulfonamide and its N^1- and N^4-derivatives, salts and complexes, compiled up to 1985 inclusive, have been divided into three volumes on the basis of chemical structure of the compounds.

The first volume includes the solubility of 2-aminobenzenesulfonamide, 3-aminobenzenesulfonamide, 4-aminobenzenesulfonamide and the derivatives of the last-named compound substituted at either of the nitrogen atoms, or both, with non-cyclic substituents (see System Index at the end of the first volume). The aroyl substituents, -C(:O)aryl, have also been included here. The second volume includes sulfanilamide derivatives substituted with 5-membered heterocyclic rings at either of the nitrogen atoms, and their derivatives. The third volume covers the solubilities of the derivatives substituted with 6-membered rings, mixtues of sulfonamides, and miscellanea. The compilations do not include compounds devoid of the $-NH_2$, -NHR or $-NR_2$ group in the benzene ring.

The solvent systems include all solvents with the exception of body fluids. The order of solvents for a particular solute are as follows: water; water–mineral acid; water–mineral base; water–mineral salt; water–miscellaneous mineral components; water–mineral and organic compounds; water–organic components; organic solvents; carboxylic acid and their salts; aliphatic acids; aromatic acids; other acids; alcohols, phenols (mono-, di-, polyhydric); amides; amines; aliphatic amines (primary, secondary, tertiary); aromatic amines (primary, secondary, tertiary); other amines; aminoalcohols; carboxylic acid esters; ethers (excluding tensides); hydrocarbons; aliphatic hydrocarbons; aromatic hydrocarbons; miscellaneous hydrocarbons; halogenated hydrocarbons (fluoro-, chloro-, bromo-, iodo-); aliphatic halogenated hydrocarbons; aromatic halogenated hydrocarbons; ketones; tensides (surface-active agents); miscellaneous organic solvents.

4-Aminobenzenesulfonamides. Part I: Non-cyclic substituents; Part II: 5-Membered heterocyclic substituents; Part III: 6-Membered heterocyclic substituents and miscellaneous systems (*Volumes 34 to 36, respectively of the* Solubility Data Series) *are edited by Anthony N. Paruta and Ryszard Piekos and published by Pergamon Press, Oxford, 1988 (Parts I and II). Vol. 34: xxvi + 347 pp. ISBN 0 08 030742 6; Vol. 35: xxviii + 343 pp. ISBN 0 08 034708 8; Vol. 36: xxviii + 343 pp. Price USD 120.00 each volume.*

Hydrocarbons with water and seawater

Hydrocarbons with water and seawater. Part I: Hydrocarbons C_5 to C_7; Part II: Hydrocarbons C_8 to C_{36} edited by David G. Shaw are Volumes 37 and 38, respectively of the *Solubility Data Series*. They present a compilation and critical evaluation of solubility data which have appeared in the primary chemical literature. The systems covered include binary mixtures of (1) a liquid or solid hydrocarbon and (2) water, heavy water or seawater. For these volumes seawater has been defined as "all natural waters, synthetic seawater and aqueous solutions in which sodium chloride predominates". Hydrocarbons are defined as "all compounds containing only carbon and hydrogen", consequently halogenated hydrocarbons are not treated but are the subject of other volumes in the series. Gaseous hydrocarbons (C_1 to C_4) are also treated in other volumes.

The depth to which these systems have been studied varies considerably, ranging from benzene-water with more than 100 reports of solubility data in the literature to numerous systems for which only one report has been found. For all systems the original data are given in the authors' units. Whenever possible the reported solubility values have been converted to mass percent and mole fraction to facilitate comparison. For well-studied systems the critical evaluations include graphical presentations of the data.

Most measurements of hydrocarbon–water solubility have been made near room temperature (275–300 K) and at atmospheric pressure. Some systems have been studied at elevated temperature and pressure with enough detail to determine upper critical solution temperature.

Volumes 37 and 38 of the Solubility Data Series *are edited by David G. Shaw and published by Pergamon Press, Oxford, UK, 1989. Vol. 37: xx + 529 pp. ISBN 0 08 029215 1; Vol. 38: xxi + 561 pp. ISBN 0 08 030737 X. Price USD 120.00 each volume.*

PAC Review

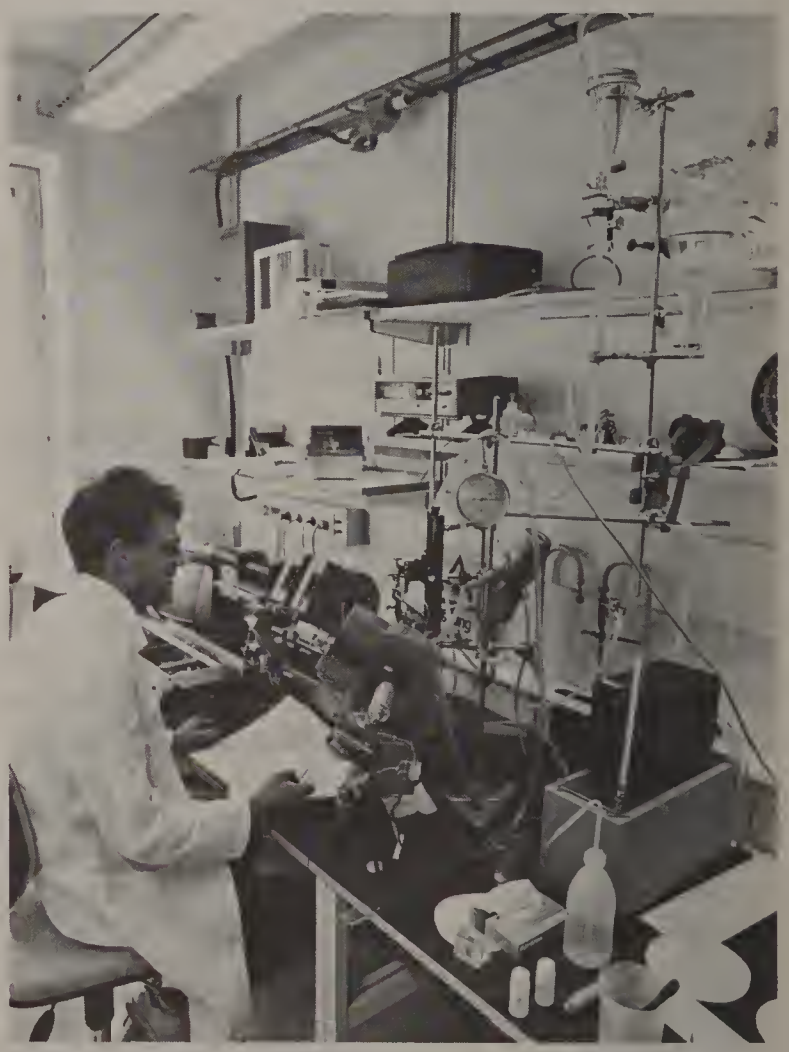
Pure and Applied Chemistry (*PAC*) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the union; the recommendations of its commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Why automate operations in the organic synthesis laboratory?

This was one of the questions asked in a lecture at the 7th International Conference on Organic Synthesis held in Nancy, France 4–7 July, 1988. Four reasons were given:

1. *To improve the quality of the observations and the reproducibility of the results*
   Whereas it is difficult for a chemist to watch more than two parameters at a time and act simultaneously on several control devices of these parameters, automatic devices can measure, record and control a practically unlimited number of parameters.

   With such devices, it is now possible to separate the functions of measurement, decision-making and action. This is why, far from being deprived of



Whereas it is difficult for a chemist to watch more than two parameters at a time and act simultaneously on several control devices of these parameters, automatic devices can measure, record and control a practically unlimited number of parameters. (*Photo courtesy Per Lindström, Lund.*)

their abilities to observe as some still claim today, on the contrary, the abilities of observation and intervention of chemists are considerably enhanced when they use well-designed automatic systems.

Use of such devices also enables the accuracy and reproducibility of results of experiments conducted under conditions of better control to be improved, which is particularly interesting for optimization studies which in most cases require an experimental plan. The results of these experiments obviously cannot be exploited unless they are reproducible.

The improvement to the quality of measurements brought about by automatic systems is often that the chemist gains access to new reaction parameters. For instance, a reactor initially designed for carrying out synthesis operations automatically enables calorimetric measurements to be made.

2. *To improve the working conditions of chemists*
   Use of automatic systems relieves the chemist of repetitive and tedious tasks thus enabling him to manage his time better. This is why he can give more time to in-depth use of the results he obtains and conceiving new experiments. The time savings also give him better control of the ever-increasing information he receives, be it chemical or otherwise and not forgetting administrative tasks which alas, show no sign of diminishing.
3. *To improve safety*
   Provided the automatic systems are well designed, well installed and well maintained, correct use enables the safety of the chemists and the laboratories to be increased.

   They in fact enable the risk of human error due to lack of attention, lassitude and fatigue to be eliminated. Equally, they enable the possible consequences of explosions or release of toxic products to be reduced. These risks can be eliminated if the automatic systems are remote-controlled in a suitably isolated chamber.

   Likewise, automatic systems enable the overall level of safety to be enhanced, since use of such systems requires the chemist to carry out prior analysis of the risks that can occur at all stages in the experiments, which is by no means the least of their advantages.
4. *To increase the productivity of research and creativity of chemists*
   In the light of what has just been described, clearly, the improvement to research productivity related to the use of automatic systems is not only quantitative in nature. To be sure, provided the safety conditions are complied with, the number of tests can be increased by using these systems without the presence of chemists.

   Primarily, however, one must stress the need to improve research productivity qualitatively, through better definition of the experimental conditions, reproducibility of the results and improvement to the intellectual and material working conditions of the principal people involved in research, namely the chemists. With these new tools at their disposal and provided they are well mastered, chemists have more freedom to use their imagination and explore new experimental fields, which very often result in an appreciable enhancement of their creativity.

The above item is extracted from the paper by Jean-Paul Guette, Noël Crenne, Henri Bulliot, Jean-Roger Desmurs, and Françoise Igersheim (France) entitled "Automation in the organic chemistry laboratory; Why? How?" which was published in the November 1988 issue of *PAC*.

Another paper presented at the Nancy conference and published in the November issue of *PAC* was concerned with organic synthesis design logic. The paper "Synthesis design logic and the SYNGEN (synthesis generation) program" by James B. Hendrickson and A. Glenn Toczko (Brandeis University, USA) describes a systematic approach to locating within a vast "synthesis tree" of possible routes to any target molecule just those few syntheses which are optimal with respect to efficiency of assembly.

The approach has two phases. In the first the target skeleton is dissected to produce convergent assembly plans from starting skeletons available in a catalogue. In the second, the chemistry is generated to produce all paths of construction reactions only, from real starting materials, for each such plan. The paper describes the SYNGEN programme to execute this search as well as some developments for programme expansion.

Solution chemistry

The December 1988 issue of *PAC* contains the invited lectures presented at the 19th International Conference on Solution Chemistry held in Lund, Sweden, 15–18 August 1988.

Corrosion

A lecture delivered by Nils-Gösta Vannerberg (Eka, Nobel AB, Sweden) was entitled "Solution chemistry and corrosion". Vannerberg pointed out that a metallic material is very seldom in chemical equilibrium with its surroundings: it corrodes.

The most important form of corrosion is atmospheric corrosion. This is not a simple oxidation process but rather a complicated electrochemical process taking place in a liquid interphase covering the solid material. It is mostly governed by small amounts of pollutants such as SO_2 and NO_2, and in industrial environments also by Cl_2 and H_2S. In such surroundings even materials covered with gold corrode forming complexes like $AuCl_4^-$ and so on.

The atmospheric degradation of iron and steel costs society enormous sums of money each year. Vanner-

berg's paper therefore concentrated on sulphur dioxide induced iron corrosion.

A laboratory experiment showed that for each SO_2 molecule adsorbed on to an iron surface, 60 iron atoms are oxidized to corrosion products. The process might be interpreted as an electrochemically governed reaction triggered by SO_2.

Vannerberg discussed the electrochemistry of iron and iron oxides as investigated by equilibrium studies, potentiodynamic studies both in active and in passive states, impedance and other measurements. Finally, he provided a semi-quantitative mechanism for corrosion. SO_2 breaks the passivation of the iron surface and iron ions leave the surface until oxygen passivates it again.

Solvation and dynamics of the lanthanide(III) ions

A paper by Cédric Cossy and André E. Merbach (Université de Lausanne, Switzerland) was concerned with "Recent developments in solvation and dynamics of the lanthanide(III) ions".

The tripositive lanthanides Ln^{3+} constitute the longest series of chemically similar metal ions. They are characterized by the progressive filling of the 4*f* orbitals from La^{3+} to Lu^{3+}. These orbitals are shielded by the surrounding filled 5*s* and 5*p* orbitals, leading to very small crystal field splittings in the lanthanide complexes. The coordination properties of the Ln^{3+} ions thus mainly depend upon the steric nature of the ligands, as illustrated by the large variety of coordination numbers (mainly 6 to 12) observed in their complexes.

The lanthanide contraction is another well-known property of this series of ions. Their ionic radii decrease regularly along the series, due to the increase of the nuclear electric field. This observation is true whatever the coordination numbers of the ions are.

Cossy and Merbach's paper was concerned with solvation, solvent exchange and complex formation processes on Ln^{3+}. Some results for the parent Y^{3+} were also included.

According to the two Lausanne scientists, the characterization of dynamic processes on Ln^{3+} involves several aspects. Among these, the influence of the counterions have to be studied. For trivalent ions like Ln^{3+}, it is likely that complex or ion pair formation with the counterion may occur in solution, especially in poorly coordinating solvents.

Special attention was paid to results obtained in aqueous and N,N-dimethylformamide solutions, where the solvent exchange reactions were characterized at variable temperature and pressure. The lecture considered coordination properties, solvent exchange rates and mechanisms in terms of electrostatic and steric factors.

Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

Electrochemical corrosion nomenclature (Recommendations 1988)

A general physicochemical definition of the term corrosion is given. The main part of the document treats electrochemical corrosion of metals and alloys including uniform corrosion in the active and passive states and various types of non-uniform corrosion.

This report was prepared for publication by K. E. Heusler, D. Landolt and S. Trasatti, Commission on Electrochemistry (I.3), Physical Chemistry Division and published in PAC, *Vol. 61, No. 1, pp. 19–22, 1989.*

The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations were taken into consideration when preparing the final report.

System for symbolic representation of reaction mechanism (Recommendations 1988)

This system is designed to provide simple descriptions of reaction mechanisms suitable for use in oral and written communication. The need arises because the system originally devised by Ingold is becoming increasingly overburdened with non-systematic modifications.

The new system describes a mechanism in terms of bond making (symbolized A for "attachment") and breaking (D, "detachment"), with subscripts and other symbols to indicate the pattern of electron movement. For example, $A_N D_N$ describes a single concerted process involving nucleophilic bond making and nucleofugic bond breaking (such as the S_N2 Ingold mechanism), and $A_N + D_N$ represents a two-step process (such as S_N1).

There is provision for describing homolytic and cyclic mechanisms, for diffusional control, and for electron transfer. Separate provision is made for symbolizing extra-mechanistic information, including the class of transformation, the nature of the substrate, and the occurrence of catalysis, using easily pronounced

terms. Thus the symbol Em-AL-B describes an elimination from an alkyl substrate under general base catalysis.

This report was prepared for publication by Robert D. Guthrie, Commission on Physical Organic Chemistry (III.2), Organic Chemistry Division and published in PAC, *Vol. 61, No. 1, pp. 23–56, 1989.*

A synopsis of the report was published as Provisional Recommendations in CI, *Vol. 9, No. 1, p. 26, 1987. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of May 1987 were taken into consideration when preparing the final report.*

The detailed linear representation of reaction mechanisms (Recommendations 1988)

These rules describe a system for the representation of models of reaction mechanisms in a linear form, using standard computer characters. A model of the reaction mechanism is described in a sufficiently detailed manner that most of the important features can be represented, and the notation can be related to the conventional diagrammatic representation of reaction mechanisms. The detail given is, however, such that it is not intended that the representation should be used in speech.

The model is described primarily in terms of bond making and bond breaking steps, but the representation allows the encoding of much other information. It allows the representation of single reaction steps or reaction sequences, and should specify exactly how the reagents are converted into the products. It is primarily designed for thermal organic reactions, but is not in principle limited to that field.

This report was prepared for publication by J. S. Littler, Commission on Physical Organic Chemistry (III.2), Organic Chemistry Division and published in PAC, *Vol. 61, No. 1, pp. 57–81, 1989.*

A synopsis of the report was published as Provisional Recommendations in CI, *Vol. 9, No. 1, p. 26, 1987. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of May 1987 were taken into consideration when preparing the final report.*

Structure and dielectric properties of vinylidene fluoride copolymers

Molecular chain structures of vinylidene fluoride (VDF)/trifluoroethylene (TrFE) copolymers were investigated by high-resolution ^{19}F NMR. It was found that the arrangement of comonomers in the VDF/TrFE copolymer chain is statistically random, and the head-to-tail connection of monomer units is predominant.

The experimental results on DSC, NMR and X-ray diffraction indicated that copolymer chains are in an isomorphically crystalline state in the whole range of copolymer compositions. In particular, 50–80 mol% VDF copolymers shows a ferroelectric character associated with a strong remanent polarization at room temperature. In addition, these copolymers exhibit a crystal phase transition associated with the appearance of an anomalous specific heat peak, abnormal peak of dielectric constant, and disappearance of remanent polarization. These results are consistent with the fact that VDF/TrFE copolymers are ferroelectric.

The dielectric constant ε' of 55 mol% VDF copolymer is 18 at 1 KHz and 24°C. The d_{31} piezoelectric constant of a roller-elongated 55 mol% VDF copolymer is 51 pC/N at 11 Hz and 24°C. The electrochemical coupling factor k_t of 75 mol% VDF copolymer in the thickness direction is 0.3. The pyroelectric constant of 55 mol% VDF copolymer is 50×10^{-5} C/M^2 K. Accordingly, VDF/TrFE copolymers can have wide range applications as transducers.

This report was prepared for publication by Y. Kubouchi, Y. Kumetani, T. Yagi, T. Masuda and A. Nakajima, Working Party on Structure and Properties of Commercial Polymers, Commission on Polymer Characterization and Properties, Macromolecular Division and published in PAC, *Vol. 61, No. 1, pp. 83–90, 1989.*

Absorptive stripping voltammetry in trace analysis

Adsorptive stripping voltammetry enables the determination of organic compounds and metal complexes exhibiting adsorption properties in the concentration range from 1.10^{-6} to 1.10^{-10} mol L^{-1}. A survey of this technique and its applications is given.

This report was prepared for publication by Robert Kalvoda and Miloslav Kopanica, Subcommittee on Environmental Analytical Chemistry, Analytical Chemistry Division and published in PAC, *Vol. 61, No. 1, pp. 97–112, 1989.*

Sodium and potassium assay of foods and biological substrates by atomic absorption spectroscopy (AAS)

An atomic absorption spectrometric (AAS) method is described for the single run determination of sodium and potassium in a wide variety of foods and biological substrates.

Accuracy and precision of the method were established by repetitive analyses of eight standard re-

ference materials. Additional performance characteristics i.e. repeatability and reproducibility, were established in a collaborative trial involving 10 laboratories and 5 samples.

For both analytes the method is adequately precise and accurate. Repeatability value *r* and reproducibility value *R* for sodium and potassium are a linear function of their respective concentration in the samples.

The suitability of the procedure is demonstrated for a wide range of biological substrates covering levels of 0.01 to 0.5 per cent by mass for sodium and of 0.1 to 2 per cent by mass for potassium.

This report was prepared for publication by H. A. M. G. Vaessen and C. G. de Kamp, Commission on Food Chemistry (VI.1), Applied Chemistry Division and published in PAC, *Vol. 61, No. 1, pp. 113–120, 1989.*

Definition and classification of interferences in analytical procedures

Based on a survey of various alternatives found in the literature a definition of interference is presented and recommendations are given for the classification of interferences in analytical procedures. It is recommended that the usage of the term interference will be restricted to the effects caused by concomitants in the sample. Several examples are given.

This report was prepared for publication by W. E. Van der Linden, Commission on Analytical Reactions and Reagents (V.1) Analytical Chemistry Division and published in PAC, *Vol. 61, No. 1, pp. 91–95, 1989.*

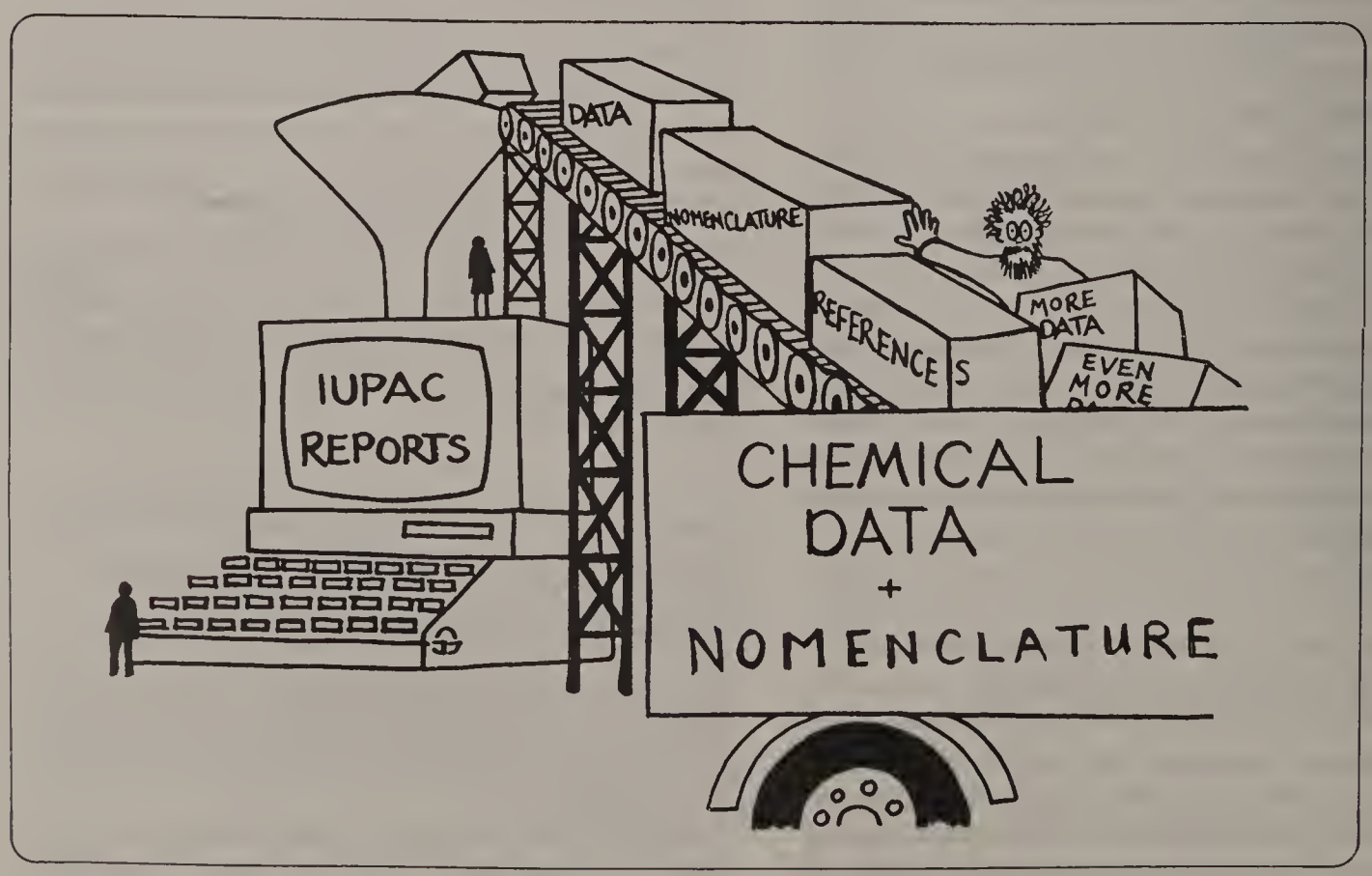
Chemical actinometry

This report is divided into three parts: (I) list of actinometers, (II) recommended actinometric procedures, (III) general considerations on chemical actinometry. The compilation lists chemical systems that have been shown to be suitable for the integration of incident light by chemical conversion. Emphasis is mainly on gas and liquid phased systems which photochemists are most frequently dealing with. In addition, some solid phase actinometers and convenient electronic devices are mentioned.

This report was prepared for publication by H. J. Kuhn, S. E. Braslavsky and R. Schmidt, Commission on Photochemistry (III.3), Organic Chemistry Division and published in PAC, *Vol. 61, No. 2, pp. 187–210, 1989.*

Definitions of terms relating to individual macromolecules, their assemblies, and dilute polymer solutions (Recommendations 1988)

This important new document provides definitions for nearly 200 basic terms dealing with such key areas of polymer physical chemistry as molecular weight, molecular-weight averages, molecular-weight distributions, the radius of gyration, the theta state, the Flory–Huggins theory, the bead–spring model, draining, sedimentation, viscosity of dilute polymer solutions, scattering of radiation by polymers, and fractionation.



Among the innovations in these definitions is the proposed use of the terms "uniform polymer" and "non-uniform polymer" to denote polymers composed of molecules that are uniform or non-uniform, respectively, with respect to relative molecular mass and constitution. These new terms are recommended as substitutes for the widely used, but non-descriptive and self-contradictory terms "monodisperse polymer" and "polydisperse polymer."

This report was prepared for publication by P. Kratochvíl and U. W. Suter, Commission on Macromolecular Nomenclature (IV.1), Macromolecular Division and published in PAC, *Vol. 61, No. 2, pp. 211–241, 1989.*

A synopsis of the report was published as Provisional Recommendations in CI, *Vol. 8, No. 3, p. 29, 1986. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of December 1986 were taken into consideration when preparing the final report.*

A classification of linear single-strand polymers (Recommendations 1988)

Prof. N. A. Platé was one of the members of the working group which prepared the report on "A classification of linear single-strand polymers".

This new classification of linear single-strand organic and inorganic polymers consists of a hierarchical scheme for naming classes of polymers according to the chemical constitution of the repeating units in the main chain.

Four levels are used; they are, in order of decreasing importance: classes, subclasses, groups, and individual polymers. Thus, the individual polymer poly(oxyethleneoxyterephthaloyl) belongs to the group of polyesters of carboxylic acids, the subclass of (oxygen, carbon)-chain polymers, and class of heterochain polymers. The presence of a specific side group can be indicated by names such as "hydroxyl-side group polymer". Many other examples are cited in the text.

This report was prepared for publication by N. A. Platé and I. M. Papisov, Commission on Macromolecular Nomenclature (IV.1), Macromolecular Division and published in PAC, *Vol. 61, No. 2, pp. 243–254, 1989.*

A synopsis of the report was published as Provisional Recommendations in CI, *Vol. 7, No. 4, p. 37, 1986. The Provisional Recommendations were sent to national/regional centres for distribution to interested chemists. Comments on the recommendations received before the end of March 1986 were taken into consideration when preparing the final report.*

Voltammetric techniques for complexation measurements in natural aquatic media: role of the size of macromolecular ligands and dissociation kinetics of complexes

The use of voltammetric techniques for the study of complexation between metal ions and synthetic or natural macromolecular ligands is critically reviewed. In particular, attention is paid to the effects of, (i) finite rates of association/dissociation of complexes, and (ii) the differences between the diffusion coefficients of the various metal species.

The present state of the theory of voltammetry for metal complex systems with unequal diffusion coefficients is reviewed and necessary extensions are indicated. Relevant experimental data from literature are compiled and classified according to the mode of interpretation. On the basis of the theoretical and experimental results, recommendations are presented for the optimal application of voltammetric methods (both direct and indirect methods) to metal complex studies.

These recommendations include the selection of suitable experimental conditions and the required mode of interpretation of the data, as well as their mutual relation. Remaining uncertainties, e.g. those due to distribution of kinetic parameters or by diffusion coefficients, are indicated.

This report was prepared for publication by Herman van Leeuwen, Robert Cleven and Jacques Buffle, Subcommittee on Environmental Analytical Chemistry, Analytical Chemistry Division and published in PAC, *Vol. 61, No. 2, pp. 255–274, 1989.*

Preparation of aims and objectives for the teaching of clinical Chemistry (Guidelines 1986)

There are great differences in educational systems around the world which makes it difficult to define comprehensive unified courses for the various groups involved in clinical chemistry. In addition, any course must relate to the particular needs for clinical chemistry services and available resources in an individual

Dr N. de Cediel was part of the team which prepared the report on "Preparation of aims and objectives for the teaching of clinical chemistry".

country. For this reason, the recommendations and guidelines previously prepared have concentrated on the delineation of outlines (syllabi) which are to be used as frameworks for local or national development of more detailed programmes appropriate to individual countries.

In order to develop or introduce courses which, although taught in many centres of learning in a country, are designed to be common throughout the country, perhaps with a view to introduction of certification, licensure or accreditation, it is of great advantage to adopt syllabi which use *educational aims* and *educational objectives*. This document is intended to provide definitions for these terms and to give guidance as to their correct development and use.

This report was prepared for publication by C. G. Fraser, N. de Cediel, A. Deom, L. Josefsson, H. G. J. Worth and O. Zinder, Commission on Teaching of Clinical Chemistry (VII.3), Clinical Chemistry Division, and International Federation of Clinical Chemistry, Education Committee. It was published in PAC, *Vol. 61, No. 2, pp. 275–279, 1989.*

IUPAC General Assembly

IUPAC general assemblies are held in odd-numbered years. This year, the 35th General Assembly will take place in Lund, Sweden, during August.

IUPAC's general assemblies are held every other year. They consist of a set of meetings of IUPAC's Council, Bureau, commissions and committees. At any one time over 30 meetings may be taking place simultaneously. Only members of IUPAC bodies (such as commissions and committees), national representatives and invited observers may attend these meetings.

Although some meetings will be held in Lund from 4 to 8 August, prior to the general assembly, the main work of the commissions and committees will commence on Wednesday 9 August and continue right through to Monday 14 August. The Bureau will then meet on 14 and 15 August and again on Thursday 17 August. The climax is reached on the 16 and 17 of the month when the Council meets. The Executive Committee also meets on the 17 August.

The Bureau acts for the union during intervals between meetings of the Council. The Council is composed of delegates of the 44 member countries. The Bureau and all the committees, divisions and commissions of IUPAC are responsible to Council.

University of Lund hosts the general assembly

The general assembly will be held on the campus of the Institute of Science and Technology of the University of Lund (LNTH). This is located about 2 km northeast of the centre of Lund. For those who are fit, it is an easy walk into the centre of Lund. Otherwise a regular bus service is available.

Accommodation for general assembly participants is available at various hotels in Lund and neighbouring Malmö as well as in apartments and students' rooms. There are also a number of camping sites within a comfortable driving distance of the meeting's location.

General assembly meetings will be held in the university's departments of mathematics and mechanical engineering as well as in the Sparta area. Meetings will also be held in the Holger Crafoords Ekonomicentrum. The Council meeting will be held in the Auditorium in the Sparta area.

The local organizing committee has arranged three receptions — on 11, 13 and 16 August. Group visits to the Chemical Centre of the University of Lund and to the science work IDEON (see below) will be arranged together with a number of sightseeing tours.

The weather in Lund in the middle of August is quite comfortable, with normal day temperatures of around 15–20°C. It is advisable to bring a raincoat or an umbrella.

LUND

The University of Lund. (*Photo courtesy Hagblom-Foto AB, Lund.*) ►

◄ IDEON, situated in Lund, is Scandinavia's biggest research village. (*Photo courtesy Per Lindström, Lund.*)

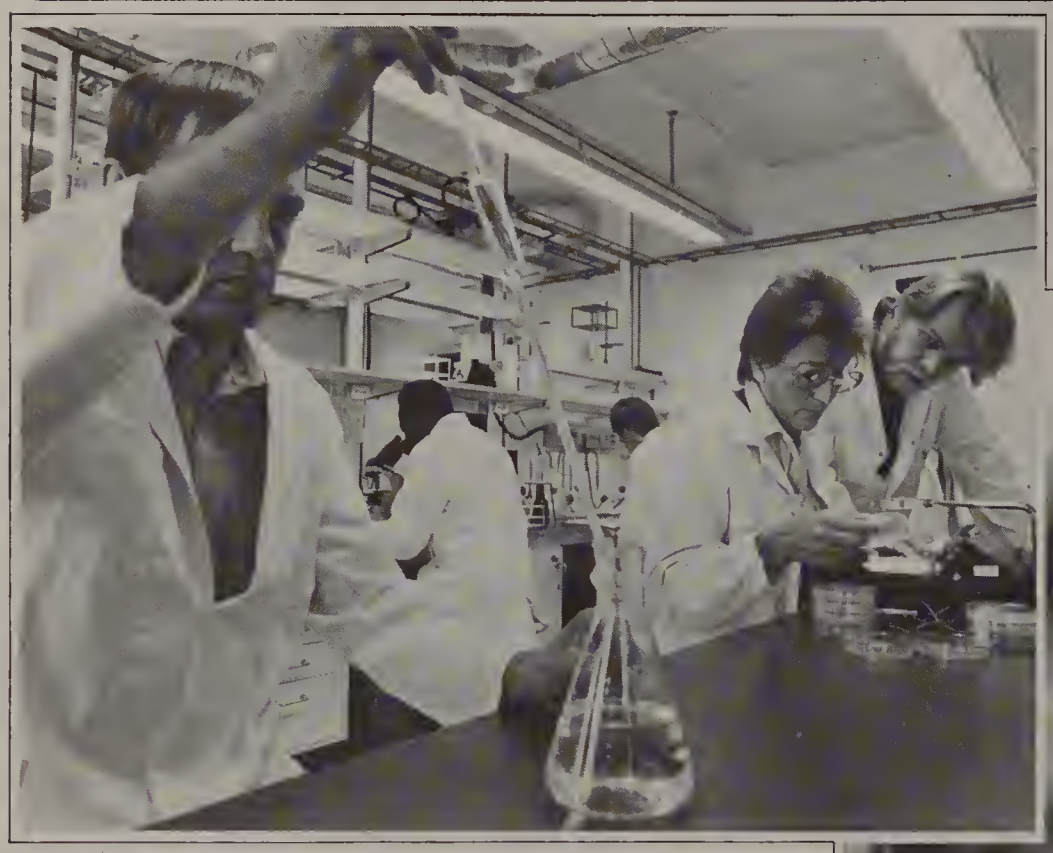
Lund Cathedral is the finest Romanesque building in Scandinavia. ▼

▲ Many of the general assembly meetings will be held in the Department of Mathematics (Building F).

Many cobbled streets wind through the centre of Lund. ▼

IUPAC General Assemblies

35th	Lund (Sweden)	1989
34th	Boston (USA)	1987
33rd	Lyon (France)	1985
32nd	Lyngby (Denmark)	1983
31st	Leuven (Belgium)	1981
30th	Davos (Switzerland)	1979
29th	Warsaw (Poland)	1977
28th	Madrid (Spain)	1975
27th	Munich (FRG)	1973
26th	Washington, DC (USA)	1971
25th	Cortina d'Ampezzo (Italy)	1969
24th	Prague (Czechoslovakia)	1967
23rd	Paris (France)	1965
22nd	London (UK)	1963
21st	Montreal (Canada)	1961
20th	Munich (FRG)	1959
19th	Paris (France)	1957
18th	Zürich (Switzerland)	1955
17th	Stockholm (Sweden)	1953
16th	New York City/ Washington, DC (USA)	1951
15th	Amsterdam (Netherlands)	1949
14th	London (UK)	1947
13th	Rome (Italy)	1938
12th	Lucerne/Zürich (Switzerland)	1936
11th	Madrid (Spain)	1934
10th	Liége (Belgium)	1930
9th	The Hague (Netherlands)	1928
8th	Warsaw (Poland)	1927
7th	Washington, DC (USA)	1926
6th	Bucharest (Romania)	1925
5th	Copenhagen (Denmark)	1924
4th	Cambridge (UK)	1923
3rd	Lyon (France)	1922
2nd	Brussels (Belgium)	1921
1st	Rome (Italy)	1920



▲ Microbiology class with food industry students at the Chemical Centre, Lund University.

A surface tension meter in use in a research project in dairy technology, in which various milk proteins are studied. (*Photos courtesy Per Lindström, Lund.*) ►

Lund: 999 years old

Lund was founded in about 990 by the Danish Viking King, Svend Forkbeard. Canute the Great, sovereign of the united kingdoms of England and Denmark singled out this site in Southern Sweden for what was later to become the religious, political, cultural and commercial centre of the whole of Scandinavia.

Today, Lund is a town of winding, sometimes cobbled streets, with many picturesque buildings. For example, Lund Cathedral, consecrated in 1145, is the finest Romanesque building in Scandinavia and a splendid testimony to the oldest archbishopric in Denmark, Norway, Sweden and Finland.

The Chemical Center, University of Lund, consists of the chemical sections of the Faculty of Science and the Faculty of Engineering of the university. It is the largest department of the University of Lund and also the largest chemical research unit in the country.

Sweden's first and Scandinavia's largest research village is situated in Lund next to LNTH. The village is called IDEON. It promotes high-tech research and development work within Swedish industry in close cooperation with Lund University.

Since its establishment in 1983, there has been a rapid increase in the number of companies with IDEON. At the moment, there are more than 100 companies in operation.

Conferences

Heteroatom chemistry
New York, USA, 16–21 July, 1989

IUPAC SPONSORED

The 2nd International Conference on Heteroatom Chemistry (CHAC-2) will be held at the State University of New York (SUNT) at Albany, 16–21 July, 1989.

The purpose of the conference is to bring together researchers examining the role of heteroatoms such as sulfur, silicon, phosphorus, tin, boron, selenium, tellurium, bismuth, fluorine and so on, in organic chemistry for such varied purposes as organic synthesis and mechanistic and structure–theoretical studies in order to promote a broader interdisciplinary exchange of knowledge than is possible at more specialized meetings.

The scientific programme will include section lectures and the following plenary lectures:

- New chemistry of fused 1,2,3-selena- and thiadiazoles (W. Ando, Japan).
- Ligand coupling in bismuth and tellurium derivatives (D. H. R. Barton, USA).
- Principles of organosulfur chemistry: the reality of molecular states (H. Block, FRG).
- Cycloaddition reactions of stable silenes (A. H. Cowley, UK).
- Preparation and some reactions of chiral sulfoxides (H. Kagan, France).
- New organosilicon intermediates (J. B. Lambert, USA).
- Synthesis and structures of some novel organometallic compounds containing boron, silicon and phosphorus (J. C. Martin, USA).
- Phospha-alkynes — new building blocks in heteroatom chemistry (M. Regitz, FRG).
- Recent advances in silicon-containing cyclic polyacetylenes (H. Sakurai, Japan).
- Uncommon bonding between sulfur and carbon, and bismuth and carbon (K. Seppelt, FRG).

The official language of the conference is English. The registration fee for active participants is USD 350.00. The fee includes the cost of a hardcover, typeset book containing the plenary and section lectures. The Albany Convention Bureau has reserved a large number of rooms at hotels near the conference centre at discount rates.

Mid-July in Albany is generally pleasant with temperatures reaching the mid-80s (°F) and occasionally the 90s. Nights tend to be cool, sometimes requiring light jackets. Rain showers occur during this time of year although they are usually brief. A travel umbrella is recommended. Since most motels and hotels have free swimming pools for use by their guests, and many nearby mountain lakes are available for recreational use, participants may wish to bring swimming apparel.

A social programme including tours, clambake and fashion, ballet and conference excursions has been arranged. A symposium banquet followed by dancing is included in the registration fee.

Bioinorganic chemistry
Cambridge, MA, USA, 24–28 July, 1989

IUPAC SPONSORED

The 4th International Conference on Bioinorganic Chemistry will be held on the campus of Massachusetts Institute of Technology (MIT), Cambridge, MA, USA. The campus is readily accessible from Boston.

The scientific programme will include poster sessions, mini-symposia and the following plenary lectures:

- Indoleamine 2,3-dioxygenase and its physiological role (O. Hayaishi, Japan).

- Electron transfer processes in metalloproteins (B. M. Hoffman, USA).
- Models for metallobiomolecular active sites (R. H. Holm, USA).
- Metal ions and DNA binding proteins (A. Klug, UK).
- Metal mediated processes relevant to metalloprotein reactions (A. M. Sargeson, Australia).

The mini-symposia topics are: medicinal applications; diagnostics and therapy; hydrolytic and group transfer chemistry; oxidases/peroxidases; nitrogen and sulfur biological cycles; organometallic intermediates; redox biochemistry/electron transfer; ribonucleotide reductase; biomineralization; metals and gene expression; metal-nucleic acid interactions; O_2-carriers/oxygenases; groups I and II metals; environmental and trace element bioinorganic chemistry; storage and transport of metals.

The conference will be based in large part upon contributed poster papers, owing to the large scientific field to be covered. These will be presented during several planned poster sessions, and will be available for viewing for most of the conference.

Solution chemistry
Jerusalem, Israel,
6–11 August, 1989

IUPAC SPONSORED

The 20th International Conference on Solution Chemistry (XX ICSC) will take place at the Ramada Renaissance Hotel, Jerusalem. The hotel is located near the Givat-Ram Campus of the Hebrew University Jerusalem.

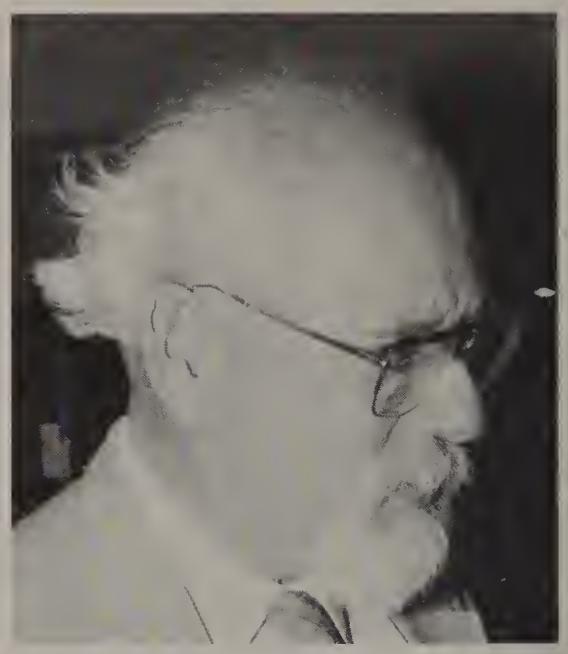
The ICSC series of conferences is an amalgamation of two successful previous series: The International Conference on Non-Aqueous Chemistry (ICNAS) and the International Symposium on Solute–Solute–Solvent Interactions (ISSSSI).

These conferences, and their successor, ICSC bring together not only solution chemists, but also scientists in other disciplines ranging from biophysics to physical organic chemistry, from oceanography to molten salts, from computer simulations to electrochemistry and from theory to practical applications.

The scientific programme includes keynote introductory lectures by invited lecturers followed by contributed shorter lectures. Posters will be displayed throughout the conference.

The following are the conference topics and keynote lectures:

- **Computer simulations** (encompassing theory of liquids and solutions). *Keynote lecture*: "Computer simulation of reactions and host–guest complexation in solution" (William L. Jorgensen, USA).
- **Electrolyte solutions** (includes all the thermodynamic, transport, and other aspects of ionic solutions, including seawater and molten salts). *Keynote lecture*: "Different models of electrolyte solutions used in the calculation and fitting of solid–liquid phase diagrams" (Robert Cohen-Adad, France).



Prof. Yizhak Marcus of the Hebrew University of Jerusalem is a coopted member of the Analytical Chemistry Division Committee and Chairman of the XX ICSC Organizing Committee.

- **Solvent mixtures** (non-electrolyte liquid mixtures and solutions therein, including the thermodynamic and structural aspects and the application of such solutions). *Keynote lecture*: "Preferential solvation in two-component systems" (Arieh Ben-Naim, Israel).
- **Spectroscopy of solvation** (all spectroscopic methods applied to the study of solvation). *Keynote lecture*: "Ionic aggregates of 1–1 salts in non-aqueous solutions: structure, thermodynamics and solvation" (Martial Chabanel, France).
- **Kinetics** (the kinetics of chemical reactions in solution, depending on solute–solvent and solute–solute). *Keynote lecture*: "Solute–solute interactions and the kinetics of chemical reactions in aqueous solution" (Michael J. Blandamer, UK).
- **Solvation in organic chemistry** (including gas-phase ion solvation, solvation of reaction intermediates, solvation in phase transfer catalysis and allied topics). *Keynote lecture*: "Free energies of cation–molecule complex formation and of cation–solvent transfers" (Robert W. Taft, USA).
- **Interactions of biological interest** (bio-physical aspects of solutions of peptides, carbohydrates, lipids and other substances of biological interest are to be discussed in terms of structures, thermodynamics, kinetics and other aspects). *Keynote lecture* by Guido Barone, Italy.
- **Micelles and polyelectrolytes** (the formation and stability of micelles and the interactions of micelles and polyelectrolytes with the solvent and any solutes are included in this topic, as well as applications of such solutions to practical problems). *Keynote lecture*: "The effect of chain packing on surfactant aggregation in aqueous solution" (Jan B. F. N. Engberts, Netherlands).

The language of the conference will be English. No translation facilities will be provided. The registration fees before/after 15 June, 1989 are: USD 160/USD 190 for active participants; USD 145/USD 170 for IUPAC affiliates and USD 90/USD 90 for accompanying persons. The fee for participants includes participation in the scientific sessions, conference kit and book of abstracts and invitations to social events.

The weather in Jerusalem in August is hot and sunny during the day and cooler by night. Temperatures range from 18°C to 30°. Informal clothing may be worn for all occasions.

Heterocyclic chemistry
Jerusalem, Israel, 13–17 August, 1989

IUPAC SPONSORED

The 12th International Congress of Heterocyclic Chemistry (ICHC) will be held at the Jerusalem Hilton Hotel. The congress aims to promote international contacts and to disseminate information about the latest advances in research in heterocyclic chemistry.

The scientific programme will include plenary lectures, main lectures, oral contributions and posters on the following topics:

1. Novel heterocyclic reagents in synthesis including asymmetric synthesis.
2. Free radicals in heterocyclic synthesis.
3. Small ring heterocycles.
4. New generation β-lactams.
5. Application of cycloadditions to stereoslective synthesis.
6. Heterocycles in bio-organic chemistry including nucleosides and enzymes.
7. Naturally occurring heterocycles.
8. Pharmaceuticals and agrochemicals.
9. New heterocycles including conducting materials and betaines.
10. Heterocycles in chelation and molecular recognition.

There will be eleven plenary lectures:

- The biosynthesis of penicillins and cephalosporins (J. E. Baldwin, Oxford University).
- Some recent applications of hydroboration/organo-borane chemistry to heterocycles (H. C. Brown, Purdue University).
- Recent progress in the synthesis of heterocyclic natural products (P. N. Confalone, E. I. Du Pont de Lemours).
- To be announced (S. Danishefsky, Yale University).
- 1,3-Dioxin-4-ones as versatile intermediates for organic synthesis (C. Kaneko, Tohoku University).
- Synthetic chemistry, neutrotransmission and second messengers (A. Kozikowski, Pittsburgh University).
- Substitutions by nucleophilic free-radicals: a new general reaction of heteroaromatic bases (F. Minisci, Milano Politecnico).
- New molecular shapes for recognition and catalysis (J. Rebek, MIT).
- Bislactim ethers of diketopiperazines: versatile reagents for the asymmetric synthesis of amino acids (U. Schoelkopf, Goettingen University).
- New heterocycles from fungi and slime molds (W. Steglich, Bonn University).
- To be announced (E. C. Taylor, Princeton University).

The official language of the congress will be English. The registration fees are before/after 15 May, 1989: USD 175/USD 225 for ISHC and IUPAC members; USD 200/USD 250 for non-members and USD 100/USD 120 for accompanying persons. Fees for members include participation in all scientific sessions, all printed material of the congress and invitations to receptions and social events except the congress dinner and excursions.

The climate in Jerusalem in August is warm and sunny during the day and slightly cooler in the evening. Temperatures range from 18°C to 32°C. Accommodation will be available in the Jerusalem Hilton Hotel and nearby 4 star hotels.

Chemical education
Waterloo, Canada, 20–25 August, 1989

IUPAC SPONSORED

The 10th International Conference on Chemical Education (10th ICCE) will take place at the University of Waterloo, Waterloo, Ontario, Canada. The theme of the conference will be "Excellence in chemistry".

The conference will focus on the elements that make the teaching, learning, evaluation, research and application of chemistry excellent. Special sessions will be devoted to the following topics:

1. **Excellence in teaching**: technology and education, low-cost educational aids, innovative teaching, teacher training, teaching chemistry with limited resources.
2. **Excellence in learning**: problem solving and study skills, gifted and minority students, impact of technology on learning.
3. **Evaluation of excellence**: chemistry olympiads, chemistry contests, science competitions.
4. **Chemical research and applications**: frontiers of chemistry, world needs and chemistry, society and chemists.

The scientific programme consists of plenary lectures, lectures on the above topics, a symposia on designing curricula, posters, workshops and discussion groups. The following plenary lectures have been arranged:

Peter Fensham of Monash University, Australia, will deliver a plenary lecture on "Excellence in learning" at the 10th ICCE.

- Initiatives of the Dutch Chemical Society (J. Hans Bouma, Netherlands).
- Search for excellence: What we have and what we don't (Carlos H. Castro-Acuña, Mexico).
- Excellence in learning (Peter J. Fensham, Australia).
- The growth of a university chemistry department (Tarekgn Gebreyesus, Ethiopia).
- Chemical knowledge for every educated person (Ronald Gillespie, Canada).
- Make "the world of chemistry" a telecourse (Roald Hoffmann, USA).
- Paradigms in research and parables in teaching (Dudley Herschback, USA).
- Culture and learning in chemistry (Frank Jenkins, Canada).
- What and how should we teach chemistry in high schools? Some misleading concepts (Kenji Tamaru, Japan).
- What's new about teaching problem solving? (Donald R. Woods, Canada).

"Towards the 21st century: symposia in designing curricula for (honours) chemistry majors" will address the questions: "how much?" "what?" "when?" "to much?" relating to present curricula. Following position papers by invited speakers, participants will have the opportunity to contribute five-minute presentations on their viewpoints, approaches, and problems encountered.

There will also be special interest group discussions and workshops on the following topics: Chemistry and the community project; The high school — university interface; and Cooperative education in chemistry. In addition there will be a six-hour pre-conference workshop on "Teaching and learning chemistry with spreadsheets" and a four-hour post-conference workshop on "Demonstrations and student experiments in chemistry".

The conference will also include a forum to discuss the International Chemistry Olympiads (ChO) and a number of commercial and educational visits exhibits.

The registration fees before/after 15 May, 1989 are: CAD 200/CAD 230 for general participants; CAD 100/CAD 120 for primary and secondary school teachers and CAD 50/CAD 60 for accompanying persons. IUPAC affiliates are entitled to a 10% reduction on the fee.

Grants: A limited number of active participants from developing countries will be eligible to receive grants to subsidize participants in the conference. Those interested should write to C. Chieh (for address see Conference Calendar) as soon as possible indicating the assistance desired, for example, registration fee, part of the expense for stay etc. A short CV detailing activities in chemical education and an abstract or a letter of the intended scientific activity at the conference should accompany the letter.

On-campus accommodation in university student residences includes all meals at a cost of CAD 220 for a single adult.

Novel aromatic compounds
Osaka, Japan,
20–25 August, 1989

IUPAC SPONSORED

The 6th International Symposium on Novel Aromatic Compounds (ISNA-6) will be held at Senri-Hankyu Hotel, Toyonaka, near the campus of the Faculty of Science of Osaka University.

This series of IUPAC-sponsored symposia started in 1970 under the heading of International Symposium on Non-benzenoid Aromatic Compounds. The scope of the series has since been extended to novel aromatic compounds and so the conference abbreviation has remained the same.

The ISNA-6 scientific programme will cover various aspects of theory, molecular design, synthesis, structural analysis, physicochemical properties, and/or potential applications of novel aromatic compounds. Plenary lectures will be given by F. Bickelhaupt (Amsterdam, Netherlands); D. O. Cowan (Baltimore, USA); S. Hünig (Wurzburg, FRG); H. W. Kroto (Sussex, UK); J.-M. Lehn (Strasbourg & Paris, France); T. Toda (Ehime, Japan) and N. Tyutyulkov (Sofia, Bulgaria).

Twenty-five or so invited talks are also being arranged. In addition, two workshops on the theories of aromaticity, anti-aromaticity, cyclic conjugation and new directions of electronic applications of organic materials will be held. Contributed papers will be presented mainly as posters.

The official language of the symposium will be English. Registration fees are JPY 40000. A programme of social events will be arranged for participants and accompanying persons. Accommodation will be available in local hotels at rates ranging from JPY 4800 to JPY 9000 per night per person.

Senri-Hankyu Hotel, Toyonaka, venue of the 6th International Symposium on Novel Aromatic Compounds.

Osaka is Japan's second largest city after Tokyo and the commercial and industrial centre of western Japan. Osaka is also a major transportation hub for international and domestic air traffic, shipping and railways. This makes the city an ideal base for visiting the nearby ancient capitals of Nara and Kyoto, the bustling port of Kobe and the Inland Sea.

Toyonaka, the symposium venue, is located about 15 km north of central Osaka and can be reached easily from both Osaka centre and the Osaka International airport, and Shin-Osaka Station of the Bullet Train.

In August the climate is hot: about 25°C to 30°C.

Applications of the Mössbauer effect *Budapest, Hungary, 4–8 September, 1989*

IUPAC SPONSORED

The major emphasis of the 1989 International Conference on the Applications of the Mössbauer Effect (ICAME '89) will be on communicating significant results achieved using Mössbauer spectroscopy.

There will be invited and submitted contributions. The majority of submitted contributions will be presented in poster sessions. Panel and round-table discussions are also planned. The language of the conference will be English.

The following is a tentative list of conference topics:

1. Chemical structure and bonding
2. Magnetism
3. Metals and alloys
4. Non-crystalline materials
5. Lattice dynamics, phase transitions
6. Superconductors
7. Relaxation effects
8. After effects of nuclear transformation
9. Radiation damage and implantation
10. Dilute and low-dimension systems, clusters
11. Surface phenomena and catalysis
12. Mineralogy, geology, archaeology
13. Biological applications
14. Coherent phenomena
15. New developments
16. Industrial applications
17. Mössbauer spectroscopy and other techniques.

The proceedings of the conference will be published within a few months of the conference in a special issue of *Hyperfine Interactions*. The price of the proceedings will not be included in the registration fee.

The conference will be held in the Budapest Convention Centre. This is situated within the green-belt area of the Hungarian capital. It is not far from the city or the Buda Castle area and has good access to the Vienna–Budapest and to the Balaton–Budapest motorways. It has easy access to bus and tram services, therefore commuting by public transport is very convenient. The Budapest–Ferihegy international airport and the railway stations can be reached by 20 to 50 minutes bus or taxi rides.

Hungary with 10.7 million inhabitants and an area of 93 thousand square kilometers, is a small European country. It is situated in a basin surrounded by the Carpathian Mountains. The capital, Budapest, a city of 2.1 million inhabitants, is the political, trade and cultural centre of the country. It can easily be reached by air, by international train and by car. It is only a few hours travelling distance from major European cities like Beograd, Berlin, Bratislava, Bucharest, Frankfurt, Kiev, Moscow, Munich, Prague, Vienna and Warsaw.

Accommodation, organized by the Budapest Convention Centre, will be available in different hotels and private rooms in Budapest.

A social programme will be included in the conference schedule and separate events for accompanying persons will also be organized. An informal welcome party, a get-together party and an excursion to the Danube Bend including dinner will be included in the registration fee.

The approximate registration fee for ICAME '90 will be DEM 300 for scientific participants before 30 June, 1989 and DEM 350 after. For accompanying persons the fee is DEM 150 and DEM 200, respectively. Participants from COMECON countries may pay in HUF. The fee covers conference attendance, book of abstracts, refreshments in the conference breaks as well as the social events mentioned above.

Plasma chemistry *Pugunochiuso, Italy, 4–8 September, 1989*

IUPAC SPONSORED

The 9th International Symposium on Plasma Chemistry (ISPC) is being organized by the Centro di Studio per la Chimica dei Plasmi — CNR, University of Bari

and will be held at the Pugnochiuso Congress Center. Since the first meeting in Kiel in 1973 ISPC has been held every two years.

The symposium incorporates a Plasma Equipment Exhibition and is followed by two Schools on Plasma Chemistry and a Workshop on Industrial Plasma Applications.

The official language of the conference will be English. No translation facilities will be provided.

The scientific programme will include an opening lecture, four plenary lectures, 18 invited lectures on topical subjects and about 400 oral and poster contributions. The symposium will cover fundamental plasma science, applications and engineering of plasma chemistry both in high- and in low-temperature fields.

The main topics are:

1. *Modelling*: (high-temperature) torch design, gas and particle injection, heat and mass transfer, plasma flows, plasma–particle interaction; (low-temperature) elementary processes, gaseous electronics, plasma processing design.
2. *Diagnostics*: high- and low-temperature plasmas.
3. *Synthesis*: solid synthesis, ultrafine particles pyrolysis, gas synthesis, ozone synthesis.
4. *Thin film technology*: etching, deposition of inorganic and polymeric thin films, hard coatings, biomedical coatings.
5. *Surface interactions*: surface treatments, modifications, plasma–wall interactions.
6. *Plasma metallurgy*: spraying melting, evaporation, extractive metallurgy.
7. *Analytical chemistry*: ICP, ashing sample treatment.

A tentative list of speakers include N. Barcza (South Africa), J. M. Baronnet (France), N. St. J. Braithwaite (UK), G. Bruno (Italy), F. Egitto (USA), D. L. Flamm (USA), A Gicquel (France), A. Harrus (USA), M. Hirose (Japan), D. L. Houk (USA), U. Kogelschatz (Switzerland), C. H. Kruger Jr (USA), H. Maecker (FRG), M. L. Mandich (USA), S. Nakayam (Japan), D. Slovetskji (USSR), O. P. Solonenko (USSR), H. D. Steffens (FRG), K. Takeda (Japan), Y. c. Lau (USA), G. G. Volpi (Italy), H. K. Yasuda (Japan) and O. I. Yas'ko (USSR).

Short courses on thermal plasma and on low-temperature (non-equilibrium) plasma, organized by the IUPAC Sub-committee on Plasma Chemistry in combination with ISPC-9 will be held on 11–13 September at the symposium venue.

The conference proceedings will be published in *PAC*. A social programme includes free welcome and farewell parties. The registration fees before/after 15 June, 1989 are ITL 220 000/ITL 280 000. All conference participants will be accommodated in the Pugnochiuso Holiday Centre which is about 15 kilometers from the nearest village. For a single room and full board the rate is ITL 130 000 per day.

Pugnochiuso is a residential centre in the Gargano resort area on the "spur" of Italy on the Adriatic coast. The magnificent forests and extensive karst limestone formations attract many tourists.

The Congress Centre is situated in a marvellous landscape, on a beautiful beach and on a surprisingly blue sea. It includes two four-star hotels, several restaurants, a shopping centre, bank and post-office, tennis courts and lots of recreation and entertainment facilities.

Thin solid and liquid films
Bristol, UK, 11–13 September, 1989

IUPAC SPONSORED

Thin films play an extensive role in both traditional and emerging technologies. Examples are foams and emulsions, surface coatings, information storage, display devices, imaging, and photoelectronic devices. Both liquid and solid (in particular "self-ordering") films are involved. The aims of the International Symposium on Thin Solid and Liquid Films to be held at the University of Bristol, UK, 11–13 September, 1989, are to review the current state of research in these broad areas, and to bring together both academic and industrial scientists from a wide variety of disciplines who have a common interest in the subject.

The main part of the symposium will consist of two plenary lectures, 15 invited lectures and two sessions of short contributions. In addition, a meeting is planned to discuss the document currently being prepared by the IUPAC working party on "Thin films" (Chairperson: Dr L. Ter-Minassian-Serga). This document will be circulated to all conference attendees and anyone who so wishes will be welcome to participate at the discussion meeting.

The symposium will be held at The School of Chemistry, University of Bristol. The school enjoys a high international reputation for its work in the area of interface and colloid science.

Accommodation will be in Goldney House in Clifton Village, a mile or so from the University of Bristol City centre. The house itself dates from the 17th century and has beautiful gardens including a grotto, overlooking the famous River Avon.

The plenary lecturers are D. Platikanov (University of Sofia, Bulgaria) and J. Swalen (IBM, USA). The invited lecturers are from Australia, Bulgaria, France, GDR, Netherlands, UK and USA.

The official language of the symposium will be English. No interpretation facilities will be available.

The total cost for attending the three day meeting, including accommodation in Goldney House, meals and conference dinner, is expected to be GBP 175 or GBP 150 for members of SCI, and IACIS and affiliate members of IUPAC. A special reduced rate of GBP 90 will be available for a limited number of *bona fide* students or for those not requiring accommodation.

Flame structure
Alma-Ata, USSR,
18–22 September, 1989

IUPAC SPONSORED

The 3rd International Seminar on Flame Structure (ISFS-89) will be held at the Kazakh Academy of Sciences, Alma-Ata. The seminar is being organized by the Institute of Chemical Kinetics and Combustion and Institute of Pure and Applied Mechanics of the Siberian Branch of the USSR Academy of Sciences.

The scientific programme includes the following lectures:

1. Mathematical modelling of premixed turbulence combustion (D. Bradley, UK).
2. Some flame features related to re-explosions (J. C. Leyer, France).
3. Oscillatory phenomena during hydrogen oxidation in open systems (W. Kordylewski, Poland).
4. Flame visualization by laser-induced fluorescence (M. J. Cottereau, France).
5. Critical review of gas flame models for transient solid propellant combustion (L. De Luca, Italy).
6. Chemical structure of sooting flames (H. G. Wagner, Germany).
7. Flame structure and general features of gas combustion theory (G. I. Ksandopulo, USSR).
8. Methods of mathematical simulation of flames in gases (Elaine Saric Oran, USA).

Contributed papers including poster communications will cover the following topics:

- Mechanism of flame propagation in gaseous and condensed systems.
- Chemical kinetics in combustion processes.
- Newest methods and techniques for combustion research.
- Mathematical simulation of gaseous and condensed systems combustion.

The official languages of the seminar will be English and Russian. Simultaneous translation will be provided. Invited lectures will be published in *PAC*.

The registration fees are SUR 60 for active participants and SUR 30 for students and accompanying persons. A 10% reduction is available for IUPAC affiliates. The fee covers entrance to all scientific sessions, seminar materials (except the issue of *PAC*), refreshments during breaks, a get-together party and excursions.

Accommodation is available in local hotels at rates ranging from SUR 40 to SUR 50 (single room) and from SUR 50 to SUR 100 (double room).

In September the weather in Alma-Ata is warm with the day temperature between 20°C and 25°C.

Kazakh Academy of Sciences, Alma-Ata, venue of the 3rd International Seminar on Flame Structure.

Light and pharmaceutical industry

The 6th Summer School on Photochemistry, "Light and pharmaceutical industry" will be held near Spiez, Switzerland, from 30 July to 5 August, 1989. This is a joint venture between the European Photochemistry Association, Inter American Photochemical Society and the Japanese Photochemistry Association.

For further information contact: Dr Thomas Oppenländer, F. Hoffman-La Roche Co. Ltd, Central Research Units, Bau 65/607, CH-4002, Basel, Switzerland.

Nutrition congress

The 14th International Congress of Nutrition will be held in Seoul, Korea from 20 to 25 August, 1989. The congress will be hosted by the Korean Nutrition Society and sponsored by the International Union of Nutritional Sciences.

The congress will include symposia on the following topics: metabolism; nutrition integrated to basic sciences; clinical nutrition; nutrition and the life cycle; nutrition and culture; methods in nutrition research; food science and technology; and animal nutrition.

Further information and registration forms from: Secretariat, 14th International Congress of Nutrition, c/o Department of Food and Nutrition, Ewha Womans University, 11-1 Daehyun-dong, Suhdaemun-ku, Seoul 120-750, Korea.

AOAC meeting and exposition

The Association of Official Analytical Chemists (AOAC) is an international professional scientific association which coordinates the development testing and validation of chemical and biological methods for the analysis of foods, drugs, feeds, fertilizers, pesticides, water, and other substances.

AOAC will hold its 103rd Annual International Meeting and Exposition in St Louis, Missouri, USA, from 25 to 28 September, 1989.

For further information contact: Marketing Department, AOAC, Suite 400, 2200 Wilson Boulevard, Arlington VA 22201-9907, USA.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in parentheses.

Cationic polymerization

5–9 June. 9th International Symposium on Cationic Polymerizations and Other Ionic Processes. Strasbourg, France.
(Secretariat of the 9th Symposium on Cationic Polymerizations, Institut Charles Sadron (CRM/EAHP), 6 rue Boussingault, 67083 Strasbourg Cedex, France.)

Fats

6–9 June. Chevreul International Congress for the Study of Fats. Angers, France.
(Chevreul International Congress Angers 1989, Centre de Congrés, 33 boulevard Carnot, 49100 Angers, France.)

Molecular design of functional polymers

26–28 June. International Symposium on Molecular Design of Functional Polymers. Seoul, Korea.
(IUPAC Symposium Secretariat, c/o Prof. Sung Chul Kim, Dept of Chem. Eng., KAIST, PO Box 131, Cheongyrang, Seoul 130-650, Korea.)

Coordination chemistry

2–7 July. 27th International Conference on Coordination Chemistry. Queensland, Australia.
(XXVII ICCC, UniQuest Limited University of Queensland, St. Lucia, Queensland 4067, Australia.)

Phosphorus chemistry

3–8 July. 11th International Conference on Phosphorus Chemistry. Tallinn, USSR.
(ICPC-1989, Tallinn Technical University, Ehitajate Tee 5, Tallinn 200108, USSR.)

Polymer blends

17–20 July. 32nd Microsymposium on Macromolecules: "Polymer Blends". Prague, Czechoslovakia.
(32nd Microsymposium, PMM Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague, Czechoslovakia.)

Heteroatom chemistry

17–22 July. 2nd International Conference on Heteroatom Chemistry (ICHAC-2). Albany, New York, USA.
(Prof. Eric Block, Department of Chemistry, SUNY at Albany, Albany, New York 12222, USA.)

Bioinorganic chemistry

24–28 July. 4th International Conference on Bioinorganic Chemistry. Cambridge, Massachusetts, USA.
(Prof. K. D. Karlin, Chairman, ICBIC-4, Department of Chemistry, SUNY at Albany, Albany, NY 12222, USA.)

Analytical chemistry

30 July–5 August. SAC 89: International Conference on Analytical Chemistry. Cambridge, UK.
(Miss P. E. Hutchinson, Secretary of the Analytical Division, Royal Society of Chemistry, Burlington House, London W1V 0BN, UK.)

IUPAC Congress

2–7 August. 32nd IUPAC Congress. Stockholm, Sweden.
(IUPAC, c/o Stockholm Convention Bureau, Box 6911, S-102 39 Stockholm, Sweden.)

Solution chemistry

6–11 August. 20th International Conference on Solution Chemistry. Jerusalem, Israel.
(Secretariat XX ICSC, PO Box 50006, Tel Aviv 615000, Israel.)

IUPAC General Assembly

9–17 August. 35th IUPAC General Assembly. Lund, Sweden.
(The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.)

Heterocyclic chemistry

13–17 August. 12th International Congress of Heterocyclic Chemistry (ICHC). Jerusalem, Israel.
(Professor A. Hassner. 12th ICHC Congress, PO Box 50006, Tel Aviv 615000, Israel.)

Chemical education

20–25 August. 10th International Conference on Chemical Education. Waterloo, Canada.
(Prof. C. Chieh, Secretary General of 10th ICCE, Chemistry Department, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1.)

Novel aromatic compounds

20–25 August. 6th International Symposium on Novel Aromatic Compounds. Tonaka, Osaka, Japan.
(Prof. Hiizu Iwamura, General Secretary of ISNA-6, Department of Chemistry, Faculty of Science, The University of Tokyo, Bunkyo-ku, Tokyo 113, Japan.)

Calorimetry and chemical thermodynamics

25–28 August. International Conference on Calorimetry and Chemical Thermodynamics. Beijing, China.
(Mr Yu Zhi-wu, Department of Chemistry, Tsinghua University, Beijing, China.)

Mössbauer effect

4–8 September. International Conference on the Applications of the Mössbauer Effect. Budapest, Hungary.
(ICAME '89, Central Research Institute for Physics, H-1525 Budapest, PO Box 49, Hungary.)

Plasma chemistry

4–8 September. 9th International Symposium on Plasma Chemistry. Pugnochiuso, Italy.
(Secretariat, ISPC-9, Centro Internazionale Congressi, Via Pio XII, 18, 70124 BARI, Italy.)

Vapour–liquid equilibria

6–8 September. 5th International Workshop on Vapour–Liquid Equilibria in 1-Alkanol + n-Alkane Mixtures. Trieste, Italy.
(CODATA/IUPAC Conferences, Prof. P. Alessi, Instituto di Chemica Applicata e Industriale, Universitá di Trieste, via Valerio 2, 34127 Trieste, Italy.)

Thin solid and liquid films

11–13 September. International Symposium on Thin Solid and Liquid Films. Bristol, UK.
(The Conference Secretariat, (Thin Solid & Liquid Films), Society of Chemical Industry, 14/15 Belgrave Square, London SW1X 8PS, UK.)

Electrochemistry

17–22 September. 40th International Society of Electrochemistry Meeting. Kyoto, Japan.
(Prof. Yasuhiko Ito, Secretary General, The 40th ISE Meeting, c/o Kyoto International Conference Hall, Takaraga-ike, Sakyo-ku, Kyoto 606, Japan.)

Flame structure

18–22 September. 3rd International Seminar on Flame Structure (ISFS-89). Alma-Ata, USSR.
(Organizing Committee, Seminar on Flame Structure, Institutskaya Street 3, Novosibirsk 630090, USSR.)

Nitroxide radicals

18–22 September. International Conference on Nitroxide Radicals (ICNR-89). Novosibirsk, USSR.
(Dr V. V. Martin, Secretary of ICNR-89, Institute of Organic Chemistry, Siberian Division of the Academy of Sciences of the USSR, Novosibirsk-630090, USSR.)

Organometallic chemistry

1–6 October. 5th International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS V). Florence, Italy.
("OMCOS-V", Dipartimento di Chimica Organica, University of Florence, Via G. Capponi, 9-50121 Florence, Italy.)

Visas

It is a condition of sponsorship that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all *bona fide* chemists from throughout the world to attend irrespective of race, religion, or political philosophy.

IUPAC sponsorship implies that entry visas will be granted to all *bona fide* chemists provided application is made not less than three months in advance. If a visa is not granted one month before the meeting the IUPAC Secretariat should be notified without delay by the applicant.

1990

Natural products

4–9 February. 17th International Symposium on the Chemistry of Natural Products. New Delhi, India.
(Dr A. V. Rama Rao, Secretary, 17th IUPAC International Symposium on the Chemistry of Natural Products, Regional Research Laboratory, Hyderabad 500 007, India.)

Polymer analysis and characterization

Spring. 3rd International Symposium on Polymer Analysis and Characterization. Dresden, German Democratic Republic.
(Dr Howard G. Barth, Du Pont Company, Experimental Station, Wilmington, Delaware 19898, USA.)

Porous solids

6–9 May. 2nd International Symposium on Characterization of Porous Solids (COPS-2). Alicante, Spain.
(Prof. F. Rodríguez-Reinoso, Departamento de Química Inorgánica e Ingeniería Química, Facultad de Ciencias, Universidad de Alicante, Apartado 99, Alicante, Spain.)

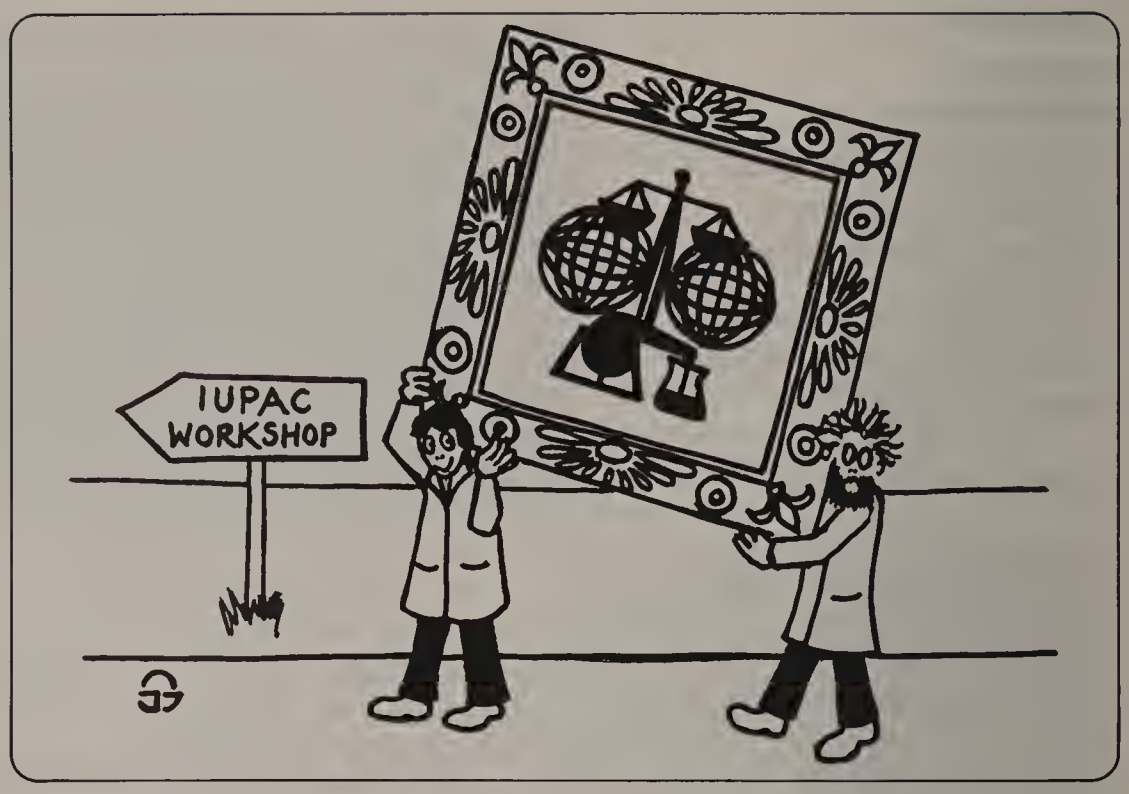
Carotenoids

20–25 May. 9th International Symposium on Carotenoids. Kyoto, Japan.

(Prof. Masayoshi Ito, Kobe Women's College of Pharmacy, 4-19-1, Motoyamakita-Machi, Higashinada-ku, Kobe 658, Japan.)

Trace elements in health and disease

5–8 June. International Symposium on Trace Elements in Health and Disease. Helsinki, Finland.
(Trace Elements in Health and Disease, Symposium Secretariat, Institute of Occupational Health, Topeliuksenkatu 41 a A, SF-00250 Helsinki, Finland.)



Ceramics

24–28 June. 6th World Ceramic Congress. Rimini, Italy.
(Dr P. Vincenzini, PO Box 174, 48018 Faenza, Italy.)

Macromolecules

8–13 July. 33rd International Symposium on Macromolecules. Montreal, Canada.
(Prof. R. E. Prud'homme, Department of Chemistry, Laval University, Sainte-Foy, Québec, Canada G1K 7P4.)

Organic synthesis

23–27 July. 8th International Conference on Organic Synthesis. Helsinki, Finland.
(Prof. T. A. Hase, c/o Travel Experts Limited, PO Box 722, SF-00101 Helsinki, Finland.)

Pesticide chemistry

5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, Federal Republic of Germany.
(Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Physical organic chemistry

6–10 August. 10th International Conference on Physical Organic Chemistry. Haifa, Israel.
(Prof. Yitzhak Apeloig, Department of Chemistry, Technion-Israel Institute of Technology, Haifa, 32000, Israel.)

Raman spectroscopy

13–17 August. 12th International Conference on Raman Spectroscopy. Columbia, South Carolina, USA.
(Prof. J. R. Durig, Department of Chemistry, University of South Carolina, Columbia, South Carolina 29208, USA.)

Coordination chemistry

13–18 August. 28th International Conference on Coordination Chemistry. Gera, GDR.
(Prof. E. Uhlig, Sektion Chemie, Friedrich-Schiller-Universität Jena, Steiger 3, Haus III, Jena 6900, German Democratic Republic.)

Safety in chemical production

10–13 September. 1st IUPAC Workshop on Safety in Chemical Production. Basel, Switzerland.
(This workshop is not open for general participation but restricted to a limited number of invited participants.)

1991

Organometallic chemistry

25–29 August. 6th International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS). Utrecht, Netherlands.
(Prof. G. van Koten, Laboratory of Organic Chemistry, Department of Metal Mediated Synthesis, University of Utrecht, Padualaan 8, 3584 CH Utrecht, Netherlands.)

Analytical sciences

25–31 August. International Congress on Analytical Sciences. Chiba, Japan.
(Prof. Eiji Niki, The Japan Society for Analytical Chemistry, 1-26-2-304 Nishigotanda, Shinagawa, Tokyo 141, Japan.)

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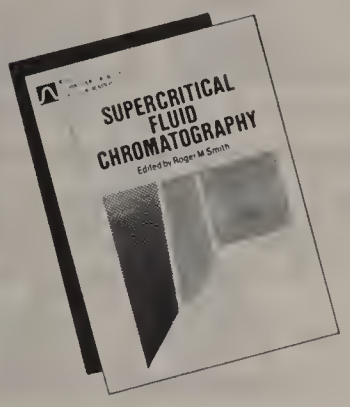

Supercritical Fluid Chromatography

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The first title in the new RSC Chromatography Monographs series, is *Supercritical Fluid Chromatography* (SFC).

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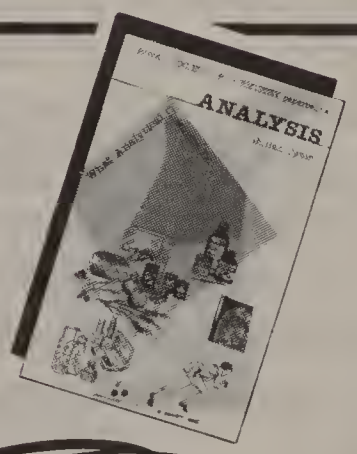
Analysis – What Analytical Chemists Do



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The book explains the chemical and physical principles involved in analytical chemistry and covers several widely used instrumental techniques. Included are atomic and molecular spectroscopies and the separation sciences, and examples of their application to such areas as medical, agricultural and forensic sciences, environmental monitoring and various manufacturing industries are provided

Analysis: What Analytical Chemists Do provides a discussion of the relevant aspects of reaction chemistry, explains how the reliability of quantitative measurements may be assessed and describes the financial constraints governing the choice of analytical method.

This book will prove invaluable to sixth-formers, undergraduates and teachers, as well as those who wish to be better informed about the scope and limitations of analytical chemistry.

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Frontiers of Macromolecular Science

Proceedings of the 32nd International Symposium on Macromolecules

Edited for the International Union of Pure and Applied Chemistry, by
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IUPAC

Published on behalf of the International Union of Pure and Applied Chemistry.

This book is the scientific proceedings of the 32nd International Symposium on Macromolecules (MACRO 88), held under the auspices of the International Union of Pure and Applied Chemistry, in Kyoto, Japan. It describes the current status of the progress of polymer science research. In addition to fundamental chemistry and physics of polymer science, high performance polymers and functional polymers, which are essential bases of the so-called 'advanced technologies' are emphasised in this book.

***Contents*:**
Polymerization chemistry; Synthesis of new polymers and polymer reactions; Structure and properties of polymers; High performance polymers; Functional polymers; Bio-related polymers.

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 44 countries, each represented by a national organization, such as an academy of science or research council.

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Front Cover: Problems of the Environment: see page 145. *(Photo courtesy International Labour Office.)*

1988 International Union of Pure and Applied Chemistry

Low-cost equipment for chemical education

Prof. Krishna Sané

Prof. Krishna Sané, Secretary of the IUPAC Committee on Teaching of Chemistry (CTC) outlines the achievements of the IUPAC/UNESCO project for the development of low-cost equipment for chemical education.

The United National Educational, Scientific and Cultural Organization (UNESCO) and CTC have collaborated since 1975 on a series of workshops and manuals to encourage the development of modern experimental university chemistry courses.

The workshops and manuals are for teachers — particularly those who face the daunting challenges in promoting experimental chemistry in developing countries where there are shortages of equipment, chemicals and technical assistance, combined with very large classes.

A workshop in progress at the Kasetsart University in Thailand. Prof. Sané is on the left.

The ambitious programme has five elements:

- To develop reliable, low-cost locally produced (LCLP) equipment which should be easy to fabricate and easy to maintain.
- To find experiments compatible with the equipment which illustrate the principles and practice of modern chemistry.
- To transfer this know-how to a sizeable number of teachers through hands-on workshops, through manuals and through videotapes.
- To set up a production unit which can supply kits and assembled equipment without a significant escalation of price.
- Curriculum changes which will assure that the whole package enables a student to be better trained for a career in chemistry.

The Edutronics Group

What has been achieved so far? A pilot project was initiated at the University of Delhi, India, in late 1979, by CTC in association with UNESCO. The project has also received valuable support from the Committee of Teaching of Science (CTS) of the International Council of Scientific Unions (ICSU) and from the Commonwealth Foundation.

The project has so far designed low-cost versions of a number of instruments needed for teaching of chemistry at the undergraduate level (see also *CI*, Vol. **8**, No. 3, pp. 8–11). These typically cost USD 20 to USD 50 per instrument. The equipment includes pH meters, colorimeters, conductance meters, polarographs, polarimeters etc.; accessories like ion selective electrodes, thermostats, magnetic stirrers; centrifuges etc.; and testing equipment for maintenance and trouble shooting.

This work has been carried out by an informal group — known as the Edutronics Group — consisting of teachers, students and technicians. Two manuals describing the equipment and the experiments have been published by UNESCO/IUPAC and can be obtained by writing to Dr J. V. Kingston, Division of Scientific Research and Higher Education, 7 Place de Fontenoy, 75700 Paris, France. More manuals are in preparation. Six videotapes have also been made for the project.

The finished instruments produced by the teachers during the Thai workshop. Every workshop almost pays for itself.

The group has held 30 teacher training workshops world-wide — on every continent. The workshops have catalysed the formation of several groups who are now independently active in Australia, Bangladesh, Brazil, France, FRG, Jordan, Puerto Rico, Thailand and elsewhere. Nearly 600 chemistry teachers have been acquainted with the project approach and nearly 1000 pieces of low-cost equipment fabricated during the workshops are in use in student laboratories.

"Nearly 1000 pieces of low-cost equipment fabricated during the workshops are in use in student laboratories"

Two-year programme

The Edutronics Group is now running a two-year programme in India under the auspices of the Indian Department of Science and Technology and the Indian University Grants Commission for 40 colleges all over the country. This involves development and design of production models based on the earlier prototypes, training of 80 teachers, following by introduction of the LCLP equipment in the student laboratories of the 40 colleges.

A major thrust of the Delhi project has been given by the Indira Gandhi National Open University (IGNOU). New Delhi, who have decided to trial the LCLP equipment for undergraduate teaching. Their initial requirement of 800 pieces has necessitated the setting-up of a production unit manned by teachers, students and technicians. It is expected that the unit will be able to deliver the equipment at essentially cost price.

Inspite of the substantial progress the IUPAC/UNESCO project has made in the past decade, an enormous amount of work remains to be done. It is hoped that in the next decade, the project will take root in Africa in the way it has now done in Asia and South America.

This polarimeter costs about USD 25 to produce.

On the development front, there is a need to design low-cost versions of more sophisticated equipment (e.g. spectrophotometers), to design low-cost computer interfaces, and to fabricate microprocessor-based instruments for teaching.

These tasks should not prove difficult given the commitment to this cause shown by several groups around the world and the enthusiastic support offered by the national, regional and international funding agencies following the lead given by UNESCO.

IUPAC can justifiably be proud of the fact that the little seed it has sown is now blossoming all over the world.

News & views

IUPAC environment initiative

Recent discussions within the IUPAC Bureau have focused on restructuring of the Union, so as to be able to respond more readily and effectively to the changing needs of chemistry (see *CI*, Vol. 11, No. 2, pp. 55–56, 1989).

A main conclusion reached is that there should be in place at any one time at least three "horizontal" interdisciplinary mission-orientated programmes involving several divisions/commissions.

In February this year, the officers of the Union took an initiative towards the first such horizontal programme — chemistry and the environment — by holding preliminary talks in Paris, France with the Scientific Committee on Problems of the Environment (SCOPE) of the International Council of Scientific Unions (ICSU) and also with the United Nations Environment Programme (UNEP).

As a basis for more detailed consideration of the

IUPAC meeting with SCOPE in Paris, February 1989. Standing (from left): IUPAC Vice-President Yves Jeannin and SCOPE Secretary General Prof. J. W. B. Stewart (Canada). Seated (from left): IUPAC President Valentin Koptyug; Secretary General Tom West; SCOPE Executive Secretary Mrs Veronique Plocq and SCOPE President Prof. F. di Castri (France).

IUPAC President Valentin Koptyug (left) discusses chemistry and the environment with Mme J. Aloisi de Larderel who is Director of UNEP's Industry and Environment Office in Paris.

collaborative role to be played by IUPAC, its Secretariat is presently compiling a booklet, with abstracts, of relevant reports issued during the past five years by its commissions and of their current projects.

Chemical databases

David Lide (back left), CCDB Chairman discusses chemical databases with Allen Stevens (back right), IUPAC Executive Secretary (front left) and Scientific Publications Secretary at the Secretariat in Oxford, UK.

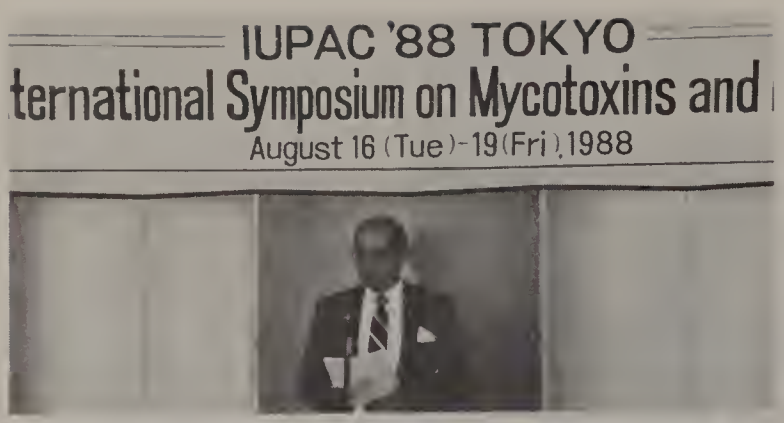
David Lide, Chairman of the Union's Committee on Chemical Databases met with Allen Stevens (Blackwell Scientific Publications), IUPAC Executive Secretary Mo Williams and Scientific Publications Secretary Dass Gujral at the IUPAC Secretariat in Oxford in February to discuss production, marketing and distribution of IUPAC databases.

The first such database to be available as a diskette for personal computers (including search and retrieval software) is based on the book *Enthalpies of vaporization of organic compounds*, published in 1985 by BSP for the Union. Eventually, IUPAC hopes to grant licenses to online vendors so that the information is also accessible on international networks.

Mycotoxins and phycotoxins

The 7th International Symposium on Mycotoxins and Phycotoxins was held from 16 to 19 August 1988 in Tokyo, Japan. The symposium was opened by Dr Al Pohland, chairman of the Commission on Food Chemistry. Profs Shinsaku Natori and Yoshio Ueno were chairman and secretary, respectively of the symposium. Over 300 scientists from 37 countries attended the symposium.

Mycotoxins and phycotoxins cause health-related problems world-wide and research on the topic is multidisciplinary and diverse in nature. The scientific programme comprised 10 main topics, each directed at a specific area of interest ranging form the ecology of



Dr Al Pohland, chairman of the Commission on Food Chemistry at the Tokyo symposium.

toxin producing fungi to the toxicology and pharmacology of phycotoxins.

Biochemist Prof. Gerald Wogan delivered a plenary address on the molecular and cellular events associated with aflatoxin induced and cellular events associated wtih aflatoxin induced hepatocarcinogenesis. In the plenary lecture on phycotoxins, Prof. Kanehisa Hashimoto presented an account of recent research on paralytic shellfish poisons in Japan. Japanese chemists have received acclaim for their contributions on these highly potent toxins such as saxitoxin and the gonyautoxins. Wogan's and Hashimoto's lectures were published in the January 1989 issue of *PAC* (see page 145 of this issue of *CI*).

A notable feature of the symposium was the recognition given to immuno-assays as a technique when applied to food analysis. Dr Michael Morgan reported on serum aflatoxin levels of mothers and neonates immediately following birth. The study was performed in Thailand. Results showed that whilst on occasion maternal levels may be low or undetectable (less than 20 pg ml^{-1}) foetal levels were often significantly elevated.

South African scientists reported a major breakthrough on the isolation and characterization of the fumonisins, a group of mycotoxins from cultures of *Fusariums moniliforme*, an important pathogen of maize. Results were announced on the reproduction of equine leukoencephalomalacia (hole in the head syndrome) in a horse with this substance.

Pieter S. Steyn

Finance Committee smells a banana

Vice-President Yves Jeannin (seated centre) with the Finance Committee at the Zürich offices of Schweizerische Bankgesellschaft, the IUPAC banker.

Finance Committee member Prof. John Ward (right) learns that some 216 constituents contribute to the banana aroma. Prof. Ward is President of the Royal Society of Chemistry, UK.

The Finance Committee meets each February to receive the IUPAC accounts for the previous year, to review the investment policy (it is official policy to maintain assets equivalent to the biennial expenditure of the Union), and to prepare budgets for the future (especially proposals for the annual subscription from the member countries). This year a restructuring of the Finance Committee was also considered.

During their meeting at Zürich, the committee paid an evening visit to the laboratories of Givaudan Ag at Dübendorf near Zürich. Givaudan, a subsidiary of IUPAC Company Associate Hoffman-La Roche, specializes in fragrances, flavours, aroma and speciality chemicals.

Stanley Brown (left), Clinical Chemistry Division President, prepares for the forthcoming IUPAC General Assembly at Lund with Vice-President Norberto Montalbetti, during a recent visit to the Union's Secretariat at Oxford, UK.

More honours for Rao

Past-President Prof. C. N. R. Rao of the Indian Institute of Science, Bangalore, has been elected Foreign Member of the USSR Academy of Sciences and also Foreign Member of the Czechoslovak Academy of Sciences.

Mike Baker retires

Dr Mike Baker (right) with ICSU President M. G. K. Menon (India) and Mme Julia Marton-Lefevre.

Dr F. W. G. ("Mike") Baker retired at the end of March as Executive Secretary of the International Council of Scientific Unions (ICSU), having completed 32 years of service.

Born near Oxford, UK, Baker was educated as a botanist. The March 1989 issue of ICSU's newsletter *Science International* contains numerous tributes to his three decades of international science.

He is succeeded by the Deputy Executive Secretary, Mme Julia Marton-Lefevre, who was born in Budapest, Hungary and educated in the USA as an environmental planner.

IUPAC Secretariat

Mrs Andria Fowler joined the IUPAC Secretariat in June 1988 as part-time assistant to Deputy Executive Secretary Ann Troughton. Her duties include working on the *IUPAC Handbook* and the IUPAC General Assembly database. Before joining IUPAC she worked at the Department of Earth Sciences, Oxford University.

Will this man survive?

Will this man survive the general assembly in Lund? Will he stay the pace? What does his division president think? For answers to these vital questions see page 142.

Heinrich Emanuel Merck Prize for Analytical Chemistry

From left: Prof Atsushi Mizuike (Nagoya), Dr Masataka Hiraide (prize winner), Mrs Hiraide, Dr Otto S. Wolfbeis (prize winner), Prof. Hans-Joachim Langmann (Managing Director of E. Merck), Mrs Wolfbeis, and Prof. Hanns Malissa (Vienna).

Dr Masataka Hiraide from Japan and Dr Otto W. Wolfbeis from Austria were joint winners of the first ever Heinrich Emanuel Merck Prize for Analytical Chemistry. The prize amounted to DEM 25 000 and included a gold medal, with a likeness of Merck, and a scroll.

The prize was presented by Prof. Hans-Joachim Langmann, Managing Director of E. Merck on 14 October 1988 at the original E. Merck building in Darmstadt, FRG. Also present were Dr Volker Koppe, head of the central analytical laboratory, Lord Mayor Günther Metzger and the Interior Minister of Hessen, Gottfried Milde together with about 400 guests.

Future prizes will be awarded every three years to young scientists who are working in the field of new analytical methods and their application to everyday life. Hiraide and Wolfbeis received their prize for work on the concentration of trace elements in metals of high purity and in natural waters and in particular for their work on the development of optical sensors.

The jury which made the recommendation for the award of the prize included several scientists who are or have been involved with IUPAC activities in analytical chemistry, including Prof. A. Hulanichi (Poland), Prof. Mitzuire (Japan) and two former Presidents of the Analytical Chemistry Division Prof. H. Malissa (Austria), 1961–65 and Secretary General Prof. T. S. West (UK), 1977–81. The jury was chaired by Prof. Günther Tölg, also formerly active in the Anlytical Division, who gave a talk at the prize-giving entitled "Efficient analysis ensures higher living standards".

Eiffel Tower centenary

Construction of the Eiffel Tower was completed 100 years ago — in May 1889. The tower was the "highlight" of the Paris Exhibition in 1889.

Gustave Eiffel (1832–1923) started work on the design of the tower in 1884. Over a period of 18 months, 50 engineers produced 5300 drawings for the tower which was constructed from 18 000 cast-iron girders. Each girder had a maximum weight of 3 tonnes.

The tower, which took over two years to build, is 302 metres high although it can expand by almost 18

"Highlight" of the 1889 Paris Exhibition.

centimetres on very hot days. During the first six months it was open the tower attracted almost 2 million visitors. At night it was lit by more than 20 000 gas lamps.

After completion, Eiffel spent some time dropping different sized objects from the top of the tower. It took about five seconds for objects to fall to the ground. Eiffel's experiments showed that the air resistance of an object was proportional to the square of its surface area.

Medicinal plants and spices

Prof. Cambie (New Zealand) presents his lecture at the Medicinal Plants and Spices Symposium in Bandung.

The 6th Asian Symposium on Medicinal Plants and Spices (ASOMPS VI), organized by the Institut Teknologi Bandung in cooperation with the Indonesian National Commission for UNESCO was held in Bandung, Indonesia, from 24–28 January 1989.

As part of its seminars/visiting professors programme, IUPAC provided financial support for the symposium in the form of a travel and subsistence grant to enable Prof. R. C. Cambie (University of Auckland, New Zealand) to attend the symposium. Cambie presented a lecture entitled "Synthesis of nagilactone precursors from totaral" and also actively participated in the academic and social programmes of ASOMPS VI.

We regret to record the death of:

Prof. R. W. Frei, Netherlands (29 January 1989) — Commission on Analytical Nomenclature (1977–1985).

Names and addresses

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Prof. I. M. Mills (Chairman, Commission on Physiochemical Symbols, Terminology and Units). Tel: +44 (734) 318456. Telex: 847813 RULIB G. Fax: +44 (734) 314404.

Prof. P. A. S. Smith (Chairman, Commission on Nomenclature of Organic Chemistry). Fax: +1 (313) 764 7355.

Prof. J. F. G. Vliegenthart (Chairman, IUB–IUPAC Joint Commission oN Biochemical Nomenclature). Rijksuniversiteit te Utrecht, Vakgroep Oranische Chemie, Postbus 80.076, 3508 TB Utrecht, Netherlands.

Letter to the Editor

Atomic weights

Sir,

Last year you published an IUPAC statement on atomic weights which said in part that atomic weights were dimensionless numbers (see *CI*, Vol. 10, No. 3, p. 94, 1988). I wrote contesting this viewpoint in a light-hearted fashion (*CI*, Vol. 10, No. 6, p. 213, 1988). I now find myself taken to task by Norman Holden (*CI*, Vol. 11, No. 2, p. 47, 1989) who complains of confusion and fuzzy thinking. He then proceeds to bolster my viewpoint by giving units for oxygen of 16.00 u (unified atomic mass units), 0.016000 kg mole^{-1} (SI units) and 16.00 g mol^{-1} ("atomic weight").

Precisely. Whether we call these designations **elemental atomic mass**, **molar mass** or **atomic weight** is a relatively minor point of semantics and most of us could live with any or all of them. It is the lack of dimensions that creates the problem: the fact that a quantity is scaled relative to a standard does not necessarily mean that it is a dimensionless number.

Sidney Toby
Affiliate Member
Rutgers University
New Jersey, USA

Affiliate Affairs

Affiliate solubility phenomenon

Affiliate Dana Knox of the New Jersey Institute of Technology, USA, was phenomenally busy at the 3rd International Symposium on Solubility Phenomena, held at the University of Surrey, UK on Tuesday 23 August last year (see pages 137–139).

In the session on "Microcalorimetry and solubility studies; models for studies of solution" held on Tuesday morning of the symposium, he contributed a paper on "Extensions of the one-parameter group contribution model for liquid mixtures". In the afternoon session on "Solubility of pollutants and other inorganic substances" he presented a paper on "Estimation of the importance of air stripping in the biological treatment of various priority pollutants". And finally, to cap it all, on Tuesday evening, he presented a poster on "Development of group-contribution mixing rules for equations of state and their use in the calculation of supercritical fluid solubilities".

Dana Knox.

Affiliates involved in macromolecular nomenclature work

Dr Pavel Kratochvíl, Chairman of the Commission on Macromolecular Nomenclature reports that several affiliates are currently engaged in the activities of the commission.

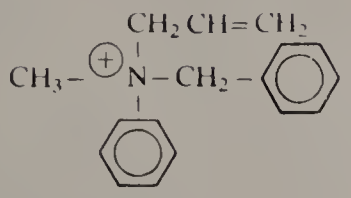
Out of 16 affiliates who expressed an interest in macromolecular nomenclature, six have been involved in the work of the commission:

- Prof. V. P. Shibaev (USSR) was elected as titular member in 1987.
- Drs J Kahovec (Czechoslovakia) and W. V. Metanomski (USA) were elected as associate members in 1987.
- Dr N. M. Bikales (USA) served as a titular member and commission secretary for many years. Although his membership finished in 1987 (because of the 12-year rule), he continues to contribute actively to the work of the commission as a correspondent.
- Dr J. I. Kroschwitz (USA) attended several meetings of the commission as an observer and has been invited to join the commission in 1989. At the moment she cooperates with the commission as a correspondent.

Affiliates Dr J. Kahovec (left) and Dr. W. V. Metanomski were elected as associate members of the Commission on Macromolecular Nomenclature in 1987.

The horror of the missing phenyl group

Affiliate Dr David Todd (Worcester Polytechnic Institute MA, USA) has written to us pointing out a "horrid error" on page 29 of the January 1989 issue of *CI*.



Todd points out that Pope and Peachey (*J. Chem. Soc.*, Vol. **75**, p.1127, 1899) resolved the above cation via its d-camphor sulfonate (according to Sidgwick, 1937 edition). Regrettably the authors of the piece (George B. Kauffman and Ivan Bernal, *PAC*, Vol. **60**, No. 8, pp.1379–1384, 1988) omitted the phenyl group — which, according to Todd, takes all the fun out of that quarternary ammonium salt.

Todd adds that if we print something like this in each issue, we will be able to get a measure of the number of chemists who take a little care in reading our "excellent publication".

Ozone resistance of rubbers and inhibition of — chain reactions

Prof. G. E. Zaikov

Prof. Guennadi Zaikov, member of the *Chemistry International* Editorial Advisory Board, describes some recent advances in work at the Institute of Chemical Physics, Moscow, on rubbers and inhibition of chain reactions with particular reference to the contributions of Prof. Nikolai Emanuel who was a member of the National Committee of Soviet Chemists (1969–84).

Ozone resistance of rubbers

Prof. Guennadi Zaikov and stamp commemorating the 50th anniversary of the Institute of Chemical Physics, Moscow.

When developing new polymer materials, including rubbers and composites, aging has to be taken into account in order to estimate the duration of their reliable working life. This is particularly important for industrial applications and their use in space.

The cracking of rubbers caused by atmospheric ozone is an often-encountered kind of degradation of unsaturated vulcanizates containing C=C bonds in the backbone chain.

The **self-restitution of polymer surface layers** — a hitherto unknown phenomenon — has been discovered at the Institute of Chemical Physics, Academy of Sciences of the USSR, Moscow. The discovery was made while studying the kinetics of ozone uptake by deformed rubbers of various constitutions. Previously, only the bird Phoenix had been known to revive from the ashes.

The phenomenon occurs as follows. The stretching of a sample deforms to some extent all segments of the vulcanizate network. In the course of subsequent rearrangements (induced by ozone addition to the C=C bonds), a segment breaks and the fragment ends draw apart owing to molecular relaxation. The system thereby returns to equilibrium. The fragment ends become shorter and are displaced relative to other macromolecules. No self-restitution of surface layers is observed in the absence of stretching.

It has also been found that the self-restitution rate of the surface layers of the rubber depends on the chemical nature of the polymer as manifested primarily in the molecular mobility of the segments.

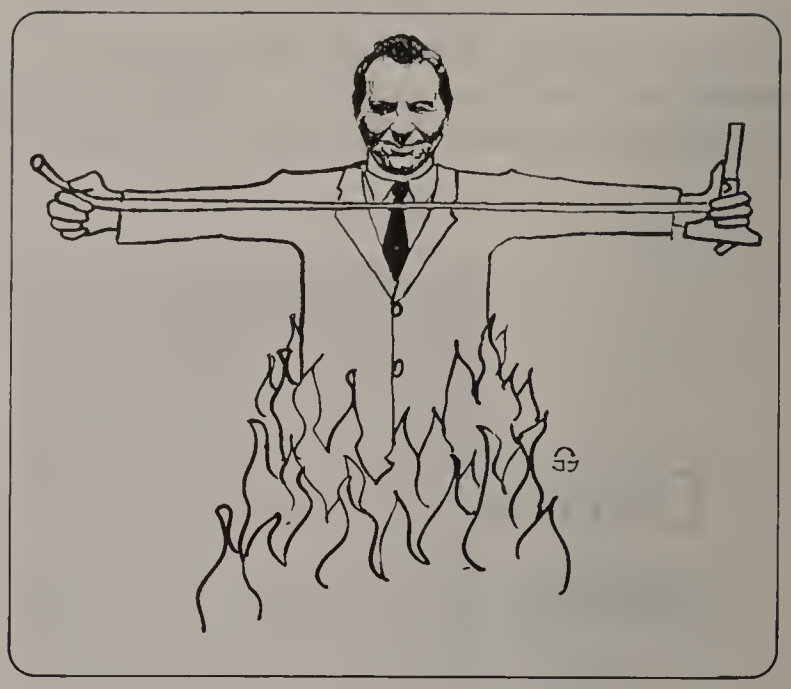
Existing concepts of the ozone-induced aging or rubber arise from durability and fatigue deformation

theories. These take no account of chemical factors. Of the physical factors believed to play a subordinate role, only the segmental and rotational mobilities of macromolecules appear to be important. The newly discovered phenomenon of self-restitution of rubber surface layers provides a different approach to the mechanism of ozone-induced ageing and thus to its possible control.

The ageing process is due to the reaction of ozone with the C=C bonds. The key points of the mechanism are the absence of any contribution from chain processes and the molecular nature of chemical reactions. Ozone diffusion from the surrounding atmosphere to the surface is seen as the limiting step in restitution of the surface and is the factor responsible for the appearance and growth of cracks. The rate of ozone uptake is identified as a dynamic characteristic of stress relaxation and the extent of cracking.

The self-restitution of surface layers results in a large separation of the macromolecules broken by the action of ozone and this is responsible for the appearance and growth of cracks.

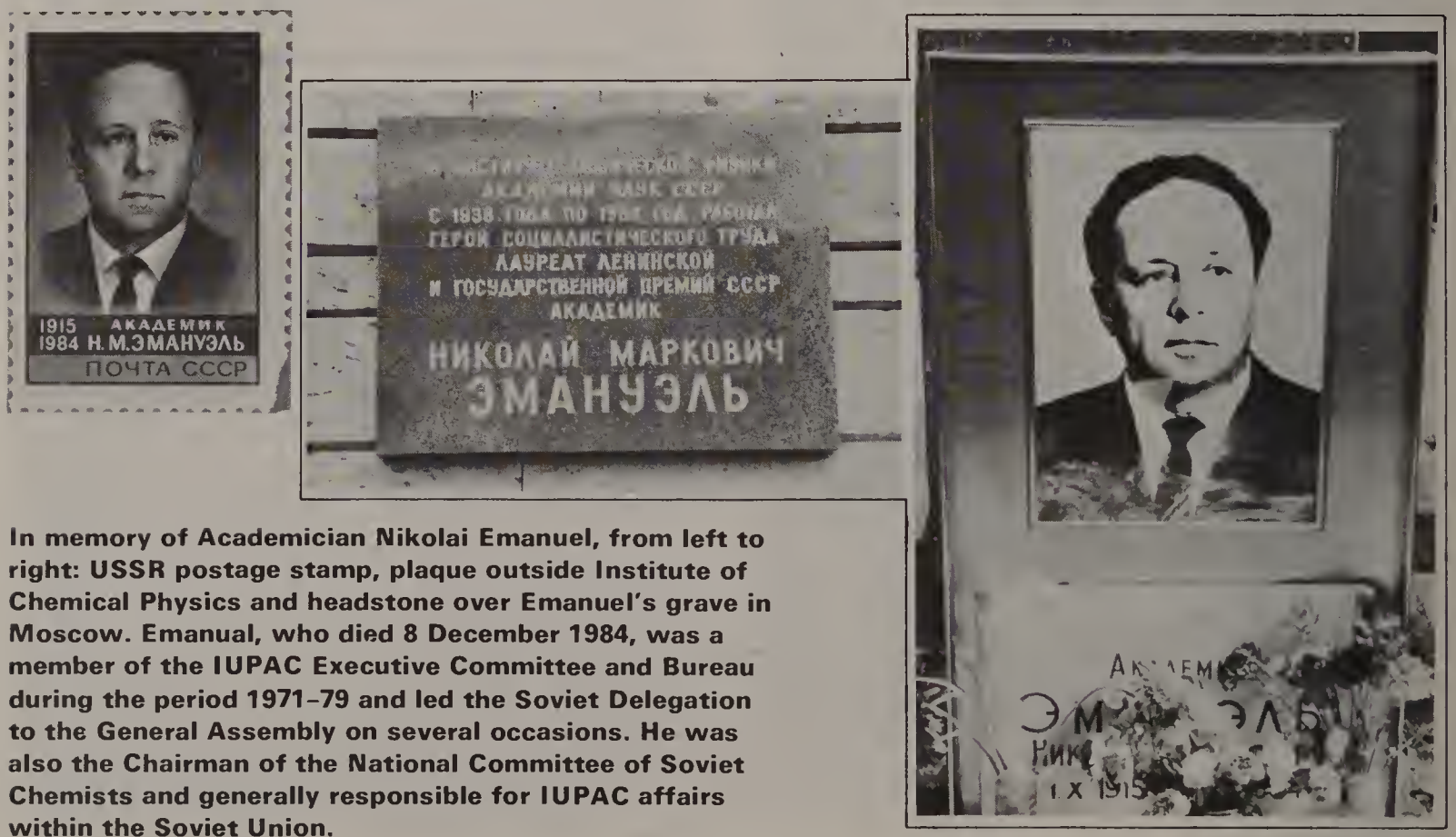
The data obtained clear up the mechanism of stress relaxation. In contrast to the accepted concept that stress relaxation is induced by diminution of the cross-section owing to cracks, two mechanisms were found to be responsible for stress relaxation: first, the breaking of active chains in the layer adjacent to the surface in sites where cracks are absent, the C=C bond concentration being steady due to the self-restitution phenomenon; secondly, cross-section diminution caused by the smaller number of active sites in a sample crossed by growing cracks. The contribution of the second process becomes considerable with high degrees of degradation.



The newly discovered phenomenon therefore reveals the connection between ozone induced chemical processes and the observed macroscopic changes in the polymer properties.

The self-restitution of the surface can be utilized in practice for estimation of the ozone resistance of rubbers: when restitution of the surface layer occurs at a high rate of ozone uptake, the rubber becomes unstable to ozone. In the opposite case, the rubber will be resistant to it.

Inhibition of chain reactions



In memory of Academician Nikolai Emanuel, from left to right: USSR postage stamp, plaque outside Institute of Chemical Physics and headstone over Emanuel's grave in Moscow. Emanual, who died 8 December 1984, was a member of the IUPAC Executive Committee and Bureau during the period 1971–79 and led the Soviet Delegation to the General Assembly on several occasions. He was also the Chairman of the National Committee of Soviet Chemists and generally responsible for IUPAC affairs within the Soviet Union.

The discovery of the selective inhibition of multicentre chain reactions was registered on 12 September 1987 at the State Committee on Inventions and Discoveries of the USSR Council of Ministers.

Research on branched chain reactions began in the 1920s and was developed in the 1930s by Profs N. N. Semenov (USSR) and C. Hinshelwood (UK). One of the first disciples of Semenov was Prof. Nikolai Emanuel who played an important part in the work of IUPAC for many years. Experimental and theoretical development of the field of slow branched chain reactions in organic gas and liquid phase oxidation was one of the basic themes of Emanuel's research.

The suppression of a reaction by addition of an inhibitor that destroys active centres and thus terminates the chain is evidence for a chain process. The essence of the phenomenon lies in a previously unknown function of multicentre process inhibitors that do not stop the reaction as such but selectively interact with one or more reaction centres. In this way they eliminate these centres from the reaction sphere without altering the direction of the process. This allows for the possibility of monitoring the composition of the reactants. Moreover, selective interaction with the active centres responsible for side reactions leads to an improvement in the desired product.

Selective inhibition requires a constant, though low, concentration of inhibitor in the system. This can be attained by use of self-reducing inhibitors, for instance by interaction of the inhibitor conversion products with the reaction mixture components (such as nitrates, that is, stable nitroxyl radicals yielded by steric-hindered piperidines), or by use of inhibitors inducing repeated chain termination (e.g. insoluble heterogeneous inhibitors).

Several novel industrial chemical processes have been proposed as a result of this work. For instance, improved selectivity has been attained for oxidation of unsaturated aldehydes (methyl acrolein, 2-ethylhexonal) to relevant oxides, as well as a quite outstanding gain in the selectivity of olefin epoxidation in the presence of aldehydes.

The method of selective inhibition used in these processes rules out the side formation of non-utilizable resinous species, ensures economy in the generally limited supply of crude oil, and opens up the possibility of developing ecologically pure, waste-free techniques. Methacrylic acids and olefin oxides are known to be the by-products of multi-tonnage production of polyesters, epoxides, and other polymers. Examples of such processes are progressively numerous.

For further information on either of these projects contact Prof. G. E. Zaikov, Institute of Chemical Physics, Academy of Sciences of the USSR, Kosygin Street 4, SU-117977, SZD-1, Moscow, V-334, USSR. Tel: +7 (3822) 355 750.

Solubility phenomena at Surrey

The University of Surrey, UK, was the venue of the 3rd International Symposium on Solubility Phenomena. Plenary and specially invited lectures from the meeting were published in the February 1989 issue of *Pure and Applied Chemistry*.

The 3rd International Symposium on Solubility Phenomena organized by the Commission on Solubility Data (V.8) of the Analytical Chemistry Division was held from 23 to 26 August 1988 at the University of Surrey, UK. This was the first symposium of its kind to take place in Europe. Previous symposia were at the University of Western Ontario, Canada in 1984 and at the New Jersey Institute of Technology, USA in 1986 (see *CI*, Vol. **9**, No. 5, pp. 194, 1987).

The scientific programme of the 3rd International Symposium consisted of seven lecture sessions and a poster session, during which different aspects of solubility were discussed. Two new topics were introduced to this symposium. These were "Macrocyclic ligands and electrolyte solubility" and "Solubility of pollutants".

Each topic was introduced by a plenary lecture. These, together with a specially invited lecture presented by Hitoshi Ohtaki on "Discussion of an NaCl crystal with the (1 1 1) and (−1 −1 −1) faces" were published in the February issue of *PAC* (Vol. **61**, No. 2, 1989).

The symposium was dedicated to the memory of Steven Kertes, Chief Editor of the *Solubility Data Series*, who died unexpectedly on 8 July 1988, as a tribute to the vital role he played in the development of the work of the Commission V.8.

Solution microcalorimetry

Bureau member Ingemar Wadsö (University of Lund, Sweden) presented the greetings of the Union at the opening ceremony. He then gave the first plenary lecture: "Solution microcalorimetry".

In his lecture he pointed out that calorimetric techniques are important in studies of interactions between solutes and solvents. His laboratory has for many years been involved in the measurement of enthalpies of solution in water, at different temperatures, of simple organic compounds. Results of such work are of a

Co-chairman Angela Danil de Namor (left) and plenary lecturer Ingmar Wadsö.

particular interest in discussions of the thermodynamic properties of biochemical systems.

During recent years the work has concentrated on studies of the hydrophobic hydration and micro-calorimeters for dissolution of slightly soluble gases, liquids and solids have been developed. The different solution microcalorimeters have now been incorporated into a modular system where the different vessels all are modifications of a microtitration vessel.

The thermodynamics of solutions

David Feakins (University College Dublin, Republic of Ireland) explored the relationship between thermodynamics and two other types of investigation in his plenary lecture.

He pointed out that *structure determinations* by neutron diffraction and computer simulation give a clear picture of first-shell solvation for a number of cations in water. Replacement of a water molecule in the complex $M(H_2O)_n^+$ by an organic ligand, S, in a mixed aqueous solvent $S–H_2O$ may result in distortion which raises the free energy of transfer ($\Delta_t G^\theta$) of the cation M^+ from water above that expected from an unhindered base-line. The sequence of these deviations is thus predictable from the known geometries, that is: $Li^+ > Na^+ > Cs^+ > Ag, H^+$.

Feakins examined the *relative viscosities* of solutions by transition-state theory. Elecrolytes like CsCl lower the free energy, and markedly, the enthalpy

Participants listen to a plenary lecture at the Surrey symposium on solubility phenomena and (right) French participants Dr and Mrs Jean Paul Canselier from Toulouse.

David Feakins (University College Dublin) who lectured on the thermodynamics of solutions.

and entropy of activation for viscous flow of water, but do not necessarily breakdown solvent structure as in the classical view. Enhanced coordination of solvent to the ions could occur in a *transition-state solvent* more weakly structured and bonded than the ground-state solvent.

Enthalpies of transfer of the "hydrophobic" solute *tert*-butanol in methanol–water mixtures suggest that TBA makes strong solute–solvent bonds, but breaks solvent–solvent bonds. The large positive activation parameters for viscous flow in highly aqueous mixtures suggest that water encages this type of solute in the ground state, thereby enhancing the solute–solvent interaction.

Dissolution of an NaCl crystal with the (1 1 1) and (−1 −1 −1) faces

In his specially invited lecture Hitoshi Ohtaki (Tokyo Institute of Technology at Nagatsuta, Japan) said that the dissolution process of a sodium chloride crystal having {1 0 0} faces in water has been demonstrated by using molecular dynamics simulations. With his co-worker Nobuhiro Fukushima, he found that chloride ions were *dissolved* but no sodium ions removed from the crystal within 7 ps.

Questions thus arose as to why chloride ions are first liberated from the crystal surfaces; what is the driving force for separating chloride ions from sodium ions; and what ions will be dissolved when other sodium chloride crystals with different faces are immersed in water?

The first two questions are rather general for the dissolution process of ionic crystals, and the third question requires us to demonstrate the molecular dynamics simulation procedure for another type of sodium chloride crystal.

Ohtaki and Fukushima applied the molecular simulation to a sodium chloride crystal with the (1 1 1) and (−1 −1 −1) faces, the former consisting of only chloride ions and the latter only sodium ions and compared the result with that obtained for a cubic crystal.

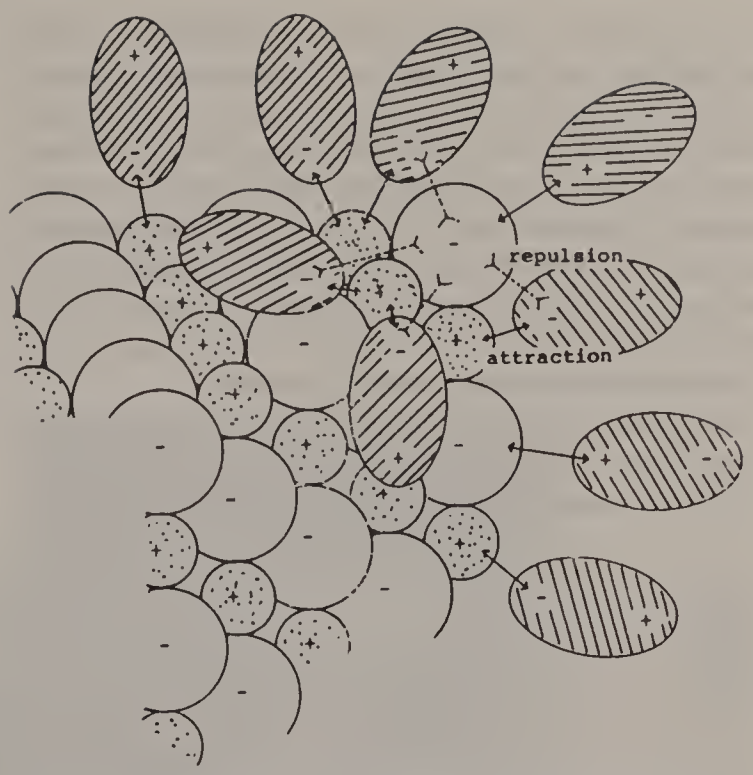
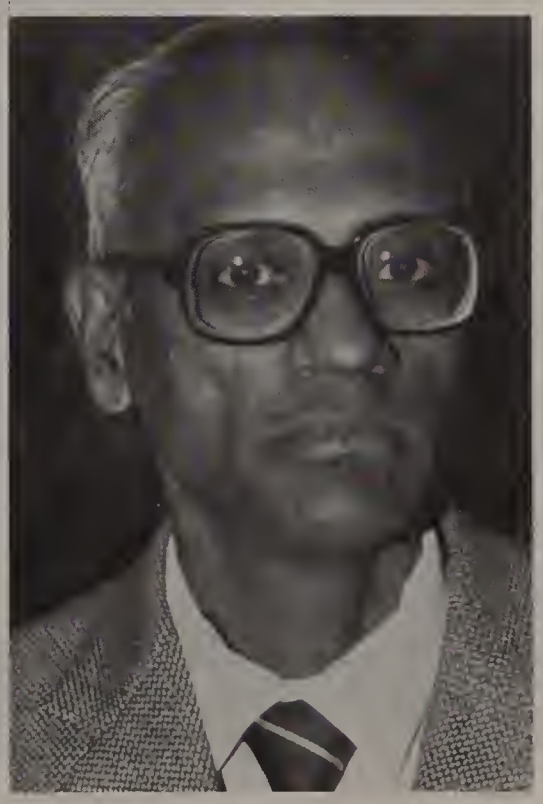


Figure: scheme of liberation of a chloride ion at a corner of a sodium chloride crystal in water.

From their work, they concluded that repulsive forces arising between chloride ions and water molecules which are strongly attracted to sodium ions around the chloride ions push chloride ions out from the crystal surface thus chloride ions, which have a smaller hydration energy than sodium ions, leave the crystal surface (see figure).

Indian Institute of Technology, Madras

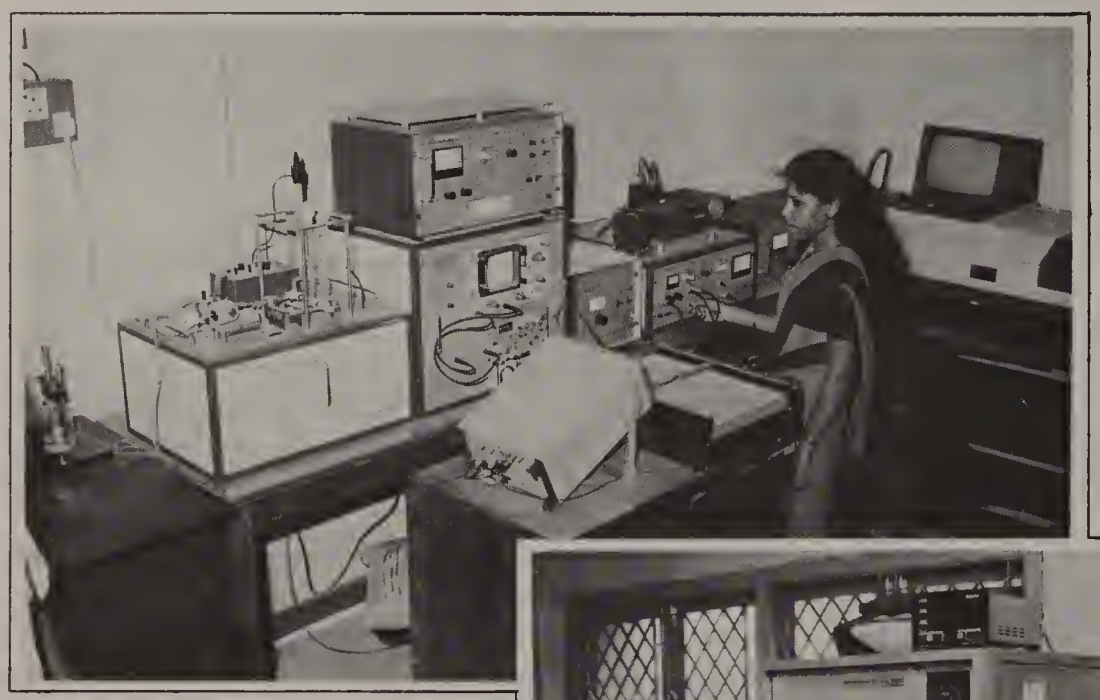


Prof. C. Kalidas.

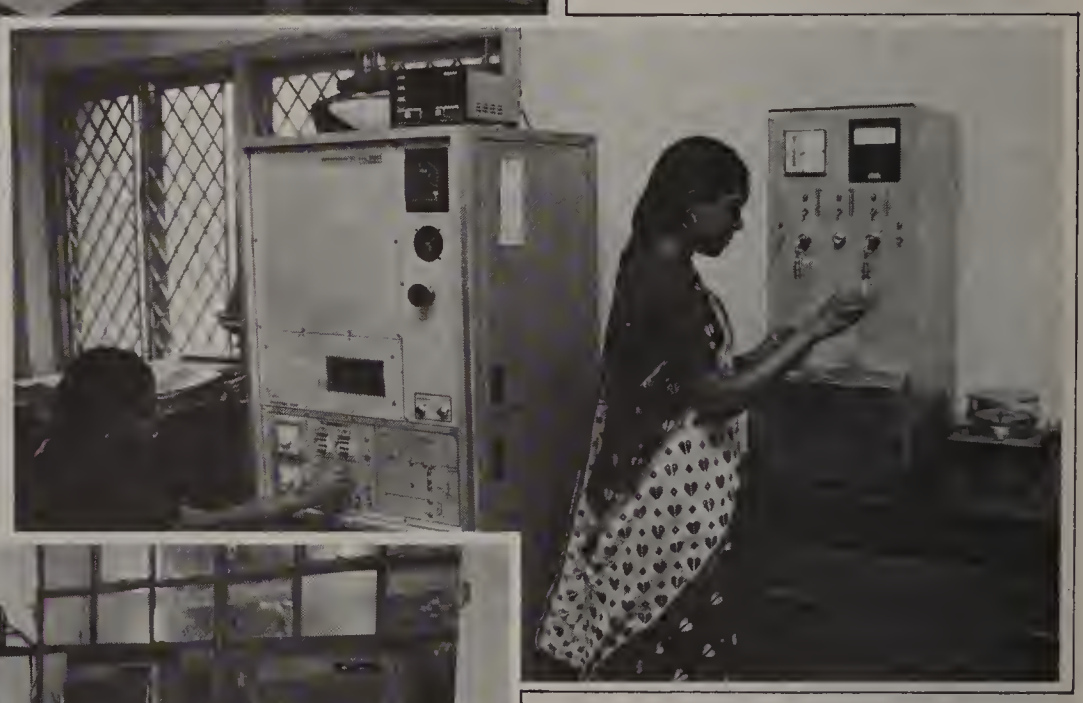
Dr C. Kalidas, Professor of Thermodynamics, Electrochemistry and Fast Reaction Kinetics at the Indian Institute of Technology, Madras, was one of several Indian scientists who presented papers at the Surrey Symposium on Solubility Phenomena. Kalidas, who is National Representative for India on the Commission on Solubility Data (V. 8) contributed a paper on "Solubilities and Gibbs transfer energies of some Cu(II) salts in water — DMSO mixtures" in the session on "Thermodynamics and solubility studies".

The Indian Institute of Technology, Madras, was established in 1959 and is a premier national institute in higher education in science and technology. Its almost self-contained campus of about 250 hectacres of wooded land is located in south Madras adjoining Raj Bhavan and Guindy deer sanctuary and park. About 2000 students, men and women, live in 12 hostels on the campus. Faculty and institute staff also have their residences on the campus.

The major areas of research of the institute's Department of Chemistry are; analytical and radiochemistry; biochemistry; catalysis; electro-chemistry; inorganic chemistry; organic chemistry; polymer chemistry, photochemistry and chemical kinetics; and spectroscopy and theoretical chemistry.



Stopped flow flash photolysis unit.



Automatic adsorption–desorption sorptometer equipment.

X-ray diffraction unit and spectrophotometer unit.

Research in the Department of Chemistry, Indian Institute of Technology, Madras.

Commission & Committee News

Quantities and units in clinical chemistry

The Commission on Quantities and Units in Clinical Chemistry (VII.2) held its 1988 meeting in Bad Tolz, FRG from 29 to 30 October 1988. The meeting immediately preceded the 1st International Federation of Clinical Chemistry (IFCC) Bergmeyer Conference in which members participated.

Following a review of activities within IUPAC, IFCC, the International Organization of Legal Metrology (OIML) and the International Organization for Standardization (ISO) relating to quantities and units used for clinical laboratory measurements, the members reviewed the current status and plans for its own ongoing projects.

Of note in the former area were discussions with the Interdivisional Committee on Nomenclature and Symbols (IDCNS) and ISO on the desirability of a special unit for quantities of dimension "one". Discussions with IDCNS on this topic relate to the units "parts per million (ppm) and parts per billion (ppb)".

The specific interest of the commission is a unit for the quantity "counts" or "number of entities" as it relates, for example, to clinical laboratory reports on the number of the blood cells in a litre of blood, the number of virus particles in a sample of biological fluid, the number of receptors on cells in a sample of tumor tissue and so on. Commission VII.2 supports recommending to the Consultative Committee on Units, BIPM (Bureau International de Poids et Mesures), consideration of a special unit for such quantities.

H. Peter Lehman, Chairman of the Commission on Quantities and Units in Clinical Chemistry.

List of quantities measured in the clinical laboratory

A current major activity of the commission is the preparation of a list of quantities measured in the clinical laboratory. This represents a review and update based on post-1978 commission projects. An example is the project on "Quantities and units for metabolic processes as a function of time". This project, coordinated by Georges Ferard, is currently in the final stage of preparation. The list is an extension of that published as "Recommendations 1978" in *PAC* (Vol. **51**, pp.2481–2502, 1979).

At present the database consists of approximately 1300 entries, compiled by Henrik Olesen at the Rigshospitalet, Copenhagen. These are classified according to clinical laboratory discipline: chemistry; haematology/coagulation; immunology; microbiology; toxicology; pharmacology; allergology; and genetics. Within each speciality, components are classified according to their chemical identity (for example: amino acid, carbohydrate, lipid, protein, ion, etc.); their physiological function (for example: enzyme, hormone, antigen/antibody, toxic agent, pharmaceutical agent, etc.) and the quantity (for example: mass concentration, substance concentration, number, ratio, fraction, etc.).

It was agreed to use World Health Organization (WHO) nomenclature for components and to solicit input from other interested groups and international organizations, such as the Union's Section on Medicinal Chemistry and the International Union of Immunology Societies, on components in their area of specialization in order to obtain wide international and interdisciplinary agreement on the presentation of laboratory data for the practice of medicine.

Semi-quantitative analysis

The commission is participating actively with groups within organizations such as IFCC in the study of the nomenclature used for "semi-quantitative analysis". Such analyses include, for example, the "dipstick" analysis widely used by physicians for the examination of urine for evidence of diabetes or kidney diseases.

With advances in technology, there are an increas-

ing number of products on the market for individual self-testing, for example for pregnancy tests, for occult blood in faeces for colon cancer. Because of the implications of unclear or falsely interpreted information derived from such tests, it is important that there are clear specifications for the quantity being measured and agreement on the way the result is presented. In particular, Commission VII.2 is examining, with a view to making recommendations, the scales and units for such measurements.

The commission agreed to conduct feasibility studies on the preparation of lists of quantities and their SI units used in clinical laboratory instrumentation and techniques, and on abbreviations used for reporting clinical laboratory quantities, for example, plasma and urine. For the first of these projects, a start has been made, in collaboration with the IFCC Committee on Instrumentation, on a list of quantities used in the centrifugation.

IFCC-Bergmeyer Conference

The Commission VII.2 project on the classification, quantities and units for protein binding assays, coordinated by Derek Bangham, formed the basis of the 1st IFCC-Bergmeyer Conference on "Improvement of comparability and compability of laboratory assay results in life sciences 1: Principles of assays in medical sciences".

The conference started with an overview by Robert Zender, former chairman of Commission VII.2, of IFCC, ISO, IUPAC and OIML activities in the area of metrology. This was followed by a commission paper on "Aspects of protein binding assays" presented by Derek Bangham as a proposed format for considering assays in all laboratory specialties. Subsequently, specialists in the areas of endocrinology, enzymology, clinical chemistry, haematology/coagulation, microbiology and toxicology reviewed analytical procedures in their specialties in an attempt to find significant common and diverse aspects in different areas.

The conference concluded with presentations on the evaluation of data handling procedures for protein binding assays, and a discussion of the problems encountered by the chemical industry in the preparation of products for clinical analysis to ensure comparability and transferability of medically significant data between methods within laboratories and between laboratories.

Subsequent conferences will be dedicated to specialty subjects, for example, the topic of the second conference is provisionally planned to be on lipoproteins, which are measured to assess risk for cardiovascular disease — a world-wide health problem. Commission VII.2 input into these conferences will be in the area of quantities and units used for the measurements and for reporting results of clinical analyses.

H. Peter Lehmann

How long will Lewis Coles last?

According to a telex received at the IUPAC Secretariat in Oxford, "Lewis Coles can never last three days" at the general assembly in Lund. That was the telexed opinion of Applied Chemistry Division President Phil Kearney. Kearney had previously informed the Secretariat that he (Kearney) would be unable to attend the final three days of the assembly.

Secretariat decoders immediately went to work on the telex and concluded that this cryptic message actually meant "Lewis Coles can cover last three days". It seems that the gremlins have extended their activities to telex machines.

Lewis Coles is currently Vice-President of the Applied Chemistry Division — and also a member of the *Chemistry International* Editorial Advisory Board. He will become president of the division at the general assembly.

Two telluriums

Tellurium (symbol Te) appears twice in the 32-column form of the Periodic Table published on page 59 of the March issue of *CI*. It appears correctly in Group 16 with atomic number 52 and incorrectly in Group 7 with atomic number 43. The element with atomic number 43 is, of course, technetium (symbol Tc) — as shown in the 18-column Periodic Table on page 59. Thanks to Prof. A. T. Balaban (Romania) for pointing out this typographical error.

Commission disbanded

The Clinical Chemistry Commission on Teaching (VII.3) ceased to exist from 31 December 1988.

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these published in *CI* as recent reports.

If you would like to comment on the provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the IUPAC Secretariat. The most up-to-date list of national/regional centres appeared in *CI*, Vol. 11, No. 2, p. 67, 1989.

Polarographic half-wave potentials of cations in non-aqueous solvents

Polarographic half-wave potentials for the reduction of Li^+, Na^+, K^+, Rb^+, Cs^+, Cu^+, Ag^+, Tl^+, Mn^{2+}, Co^{2+}, Ni^{2+}, Cu^{2+}, Zn^{2+}, Cd^{2+}, Ba^{2+}, Pb^{2+}, UO_2^{2+}, La^{3+}, Ce^{3+}, Pr^{3+}, Nd^{3+}, Sm^{3+}, Sm^{2+}, Eu^{3+}, Eu^{2+}, Gd^{3+}, Tb^{3+}, Dy^{3+}, Ho^{3+}, Tm^{3+}, Er^{3+}, Yb^{3+} and Yb^{2+} *versus* bis(biphenyl)-chromium(I)/(0) have been compiled in up to 38 non-aqueous solvents. The potentials of the silver/0.01 mol dm^{-3} silver(I) ion electrodes and the Hg/0.01 mol dm^{-3} mercury(II) ion electrodes in the respective supporting electrolytes as well as the $\frac{1}{2}(E_{pa} + E_{pc})$ values for the oxidation of ferrocene *versus* bis(biphenyl)chromium(I)/(0) are included. The accessible potential ranges on the dropping mercury electrode in polarography and on the platinum electrode in cyclic voltammetry are given together with the specific conductivities of 0.1 mol dm^{-3} solutions of tetrabutylammonium perchlorate in the respective solvents.

Comments on the document should be sent by 28 February 1990 to: G. Gritzner, Institut für Chemische Technologies Anorganischer Stoffe, Johannes Kepler Universität Linz, A-4040 Linz/Auhof, Austria.

Distribution of provisional recommendations in FRG

Page 67 of the March 1989 issue of *CI* contained a list of national/regional centres for the distribution of provisional recommendations. We have since been notified that Dr Eva Wille is now responsible for the national centre of the Federal Republic of Germany. Requests from inside FRG for copies of provisional recommendations should be sent to: Dr Eva Wille, Journal Department Manager, VCH Verlagsgesellschaft, Postfach 1260/1280, D-6940 Weinheim, Federal Republic of Germany.

Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

Nomenclature for organic chemical transformations (Recommendations 1988)

These rules provide a general system of nomenclature for transformations whereby one organic compound is converted into another. A *transformation* is distinct from a *reaction* in that it describes only those changes that are involved in converting the structure of a substrate into that of a product, regardless of the reagent or the precise nature of the substrate, or (with some exceptions) the mechanism. Thus all processes in which *X*–H is converted into *X*–NO_2 are examples of the single transformation called "nitration", whatever the nature of *X*, and irrespective of whether the reaction entails the replacement of H^+ by NO_2^+, of $H^\cdot$ by $NO_2^\cdot$, or of H^- by NO_2^-.

The basis of the names of all transformations is that they provide a description of the conversion of substrate into product by giving a string or strings of the names of groups or entities that become attached to and/or detached from the substrate, followed by a suffix that describes the nature of the transformation. Straightforward examples are self-explanatory; for example: "hydro, chloro-addition"; "dibromo-elimination"; "hydroxy-de-iodo-substitution". For many transformations, particularly substitutions, simplified names are recommended for use in speech or writing (by contrast to the more detailed indexing names). Thus "hydroxy-de-iodination" may be used instead of "hydroxy-de-iodo-substitution", or "nitration" instead of "nitro-de-hydro-substitution". A list

of non-systematic names is given for transformations that are too complex to be named by the present systematic rules.

This report was prepared for publication by R. A. Y. Jones and J. F. Bunnett, Commission on Physical Organic Chemistry (III.2), Organic Chemistry Division, and published in PAC, *Vol. 61, No. 4, pp. 725–768, 1989.*

Definitions of terms relating to crystalline polymers (Recommendations 1988)

These recommendations are concerned with the terminology relating to the process of crystallization and to two main types of crystal structure, that is, those comprising essentially rectilinear, parallel-packed chains, and those comprising so-called globular macromolecules. Since the latter are biological in nature, they are not covered in detail. Furthermore, the document is limited to systems exhibiting crystallinity in the classical sense of three-dimensionally periodic regularity; accordingly, macromolecular systems with mesophases are omitted.

After a statement of basic definitions, the subject is subdivided into sections dealing separately with structural and kinetic aspects. There are two structural sections; the first is directed to local structural arrangements, at the scale of a few bond lengths, and the second to those at the scale of the macromolecule as a whole and to assemblies of macromolecules.

This report was prepared for publication by a Working Group of the Commission on Macromolecular Nomenclature (IV.1), Macromolecular Division, and published in PAC, *Vol. 61, No. 4, pp. 769–785, 1989.*

PAC Review

Pure and Applied Chemistry (*PAC*) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Paralytic shellfish poison

Paralytic shellfish poison (PSP) is one of the most notorious marine toxins known. Once ingested by humans, it evokes paralysis, other symptoms, and frequently death. It is estimated that the number of victims of paralytic shellfish poisoning world-wide between 1972–83 exceeded 900, including 40 deaths.

In 1983, for example, a large-scale red tide with *Pyr. bahamense* as the dominant species spread over South East Asia, resulting in many poisoning incidents in the Philippines and Thailand. PSP poisoning incidents were first reported in Taiwan and Korea in 1986.

In Japan, the occurrence of *Protogonyaulax catenella* red tide, along with PSP infestation of bivalves, was for the first time confirmed in 1975, at Owase Bay, Mie Prefecture. Since then, extensive studies have been carried out on various aspects of PSP. These include the search for, and identification of, responsible plankton species, surveillance of, responsible plankton species, surveillance for PSP-infested areas and bivalves, isolation and characterization of PSP components, development of chemical assay methods, ichthyotoxicity of PSPs and the search for other PSP-bearing organisms.

Kanehisa Hashimoto and Tamao Noguchi (University of Tokyo, Japan) reviewed recent PSP studies in Japan in a paper presented at the 7th International Symposium on Mycotoxins and Phycotoxins held in Tokyo, Japan, 16–19 August 1988. The paper was published in the January 1989 issue of *PAC* together with the plenary lecture by Gerlad N. Wogan (MIT, USA) on "Moleular and cellular events associated with aflatoxin-induced hepatocarcinogenesis".

The January issue of *PAC* also contains seven IUPAC Recommendations on Nomenclature and Symbols and Technical Reports from Commissions. Summaries of these reports were published in *CI* (Vol. 11, No. 3, pages 110–112).

Safeguarding our tomorrows

Our planet is undergoing rapid and far reaching changes to its environmental and atmospheric make-up; changes that will have enormous impact on the way we live, and which threaten the survival of a vast number of the world's species, if not mankind. *Unesco Sources* editor Sue Williams examines these changes and outlines the efforts of the Man and Biosphere Programme (MAB) of the United Nations Educational, Scientific and Cultural Organization (UNESCO) to help man better adapt to his changing situation.

"The Greenhouse Effect is already underway and we have less than 10 years to turn the situation around".

This dire warning comes from US scientist Dr Thomas Lovejoy, who believes that unless the environmental problems facing the Earth are not seriously tackled by the end of the century it will be too late to prevent a global catastrophe which would result in the loss of two thirds of the Earth's biological species within 50 years and radically alter the conditions by which the human population survives.

Dr Lovejoy, who is the chairman for the US Committee for UNESCO's Man and Biosphere Programme (MAB) and Assistant Secretary for External Affairs at the Smithsonian Institution in Washington, backs up his prediction with some startling figures: *"Between 10 000 and 100 000 biological species are becoming extinct each year, that's about 10 000 times the normal rate"*, he told *Sources*.

This dramatic situation is largely due to the impact of man on his environment and the changes he is wreaking on the chemical properties of the atmosphere, notably through the increasing amounts of carbon dioxide being pumped into the heavens, causing the Earth to heat up; the phenomenon known as the Greenhouse Effect.

According to Dr Lovejoy, carbon dioxide is accumulating in the atmosphere at an annual rate of 2.5 to 3 billion tons, most of which comes from the burning of fossil fuels such as coal and oil for transport, electricity production and heating. The carbon dioxide and other so-called Greenhouse Gases, such as methane, absorb an increasing amount of the heat radiated from the Earth which would normally escape into space.

"This situation has already increased the Earth's temperature by point seven of a degree Celsius", the US scientist said, pointing out that a two degree global increase can convert to temperature changes of five to ten degrees in higher latitudes. Current predictions indicate that this increase will have been reached by the year 2030.

In other words the warming expected in the next 50 years will exceed any climatic change experienced in human history.

The ozone threat

Another big problem for humanity is the deterioration of the ozone layer; that delicate veil of gas some 25 kilometres above the Earth's surface which protects the planet's inhabitants from lethal levels of ultraviolet radiation from the Sun.

Home for a huge range of biological species, forests with their ability to absorb carbon dioxide, also act as the world's lungs. More than 11 million hectares of forest, like this site in Brazil, are destroyed annually — speeding up extinction rates and the greenhouse process. (*Photo Unesco/Aubert de la Rue.*)

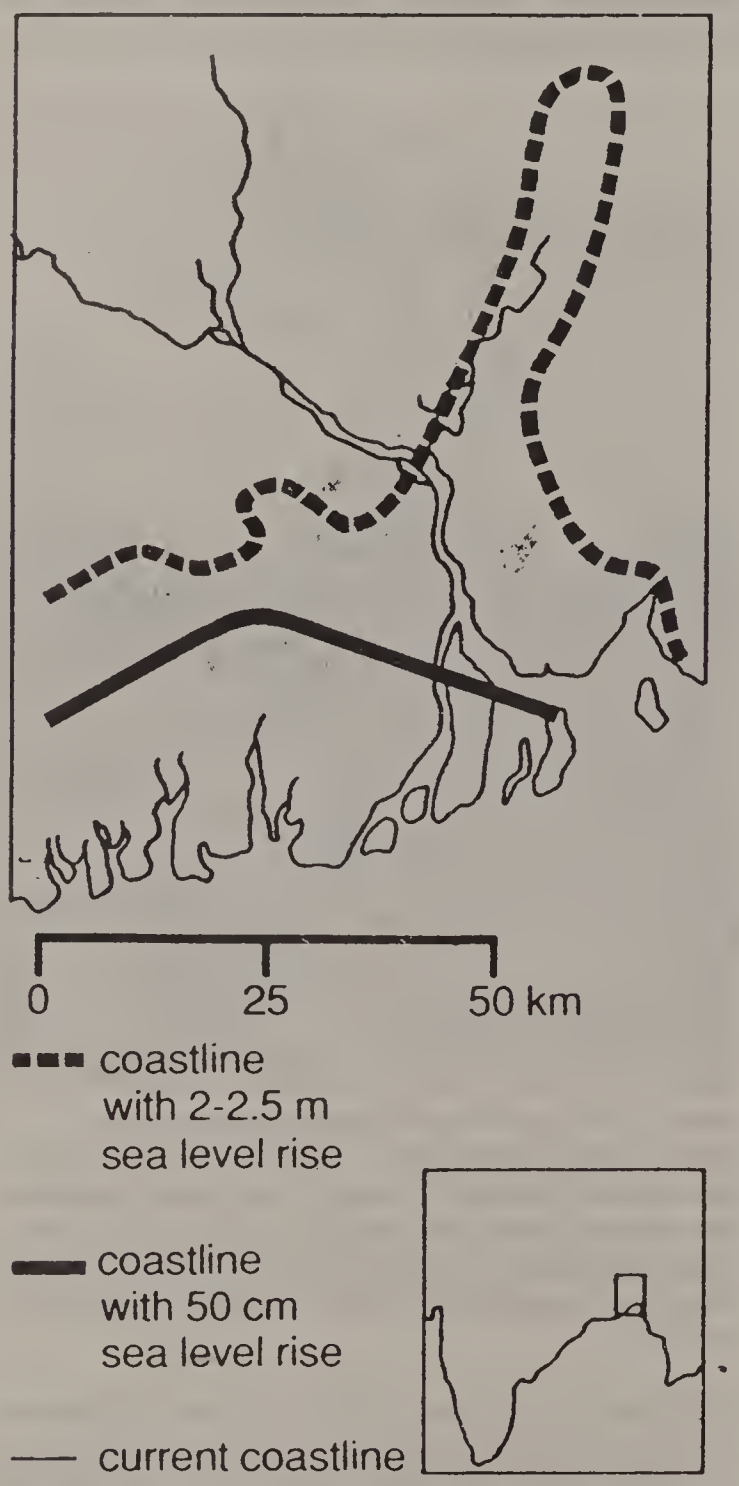
"Life on Earth depends as much on the presence of this ozone as it does on the presence of oxygen and water", warns the Executive Director of the United Nations Environment Programme (UNEP), Mostafa K. Tolba.

Chemicals released by industry are eating away at this vital filter. The main offenders are a group of chemicals called chloro-fluorocarbons, used in aerosols, refrigerators and the plastics industry. According to UNEP, overall ozone levels have not yet dropped, but measurements made during the Antarctic Spring have shown that levels there have fallen by 40%

in just a few years, creating a "*hole*" in the ozone veil.

While there is much disagreement in the scientific community over the effects of these problems, most agree their impact will be wide ranging. Apart from the mass extinctions predicted by Dr Lovejoy, the warming of the planet will cause oceans to expand, raising sea levels and threatening coastal cities and fertile agricultural deltas.

"*There will be a major reordering of agriculture in the temperate zone as new climatic and soil combinations occur*", said Dr Lovejoy.



Nearly one third of all human beings live within 60 kilometres of a coast line. A rise in sea level of even half a metre could therefore have profound effects on habitation patterns, causing many people to move and many of the world's most important cities and ports to come under threat of flood. If the average temperature increases by between 1.5 and 4.5 degrees Celsius, scientists believe sea levels could rise by 20 to 140 centimetres. This map shows how far the sea would invade Bangladesh if sea levels rose by 50 centimetres and 2.0–2.5 metres. (*Reproduced from UNEP Environment Briefs.*)

Grassland and desert areas are likely to expand, while forest areas would shrink and move towards the poles. Floods, storms and forest fires may become more common and warmer winters could mean plagues of pests which would normally have perished in the cold.

The thinning of the ozone layer will let in much more of the Sun's ultraviolet radiation, not only damaging agricultural yields and ocean ecosystems, but provoking a big increase in skin cancer and eye disease. Some 100 000 people die of skin cancer every year and UNEP calculates that a 3% reduction in ozone would produce another 20 thousand cases annually in the US alone.

Man must adapt

What can be done to combat these threats? Many ideas have been put forward, but most of them are still beyond our reach, be it for technological or economic reasons.

A feasible starting point seems to be the reduction in the rate at which fossil fuels are burnt and other Greenhouse gases are produced. Reforestation projects and preservation of existing forests could also help absorb some of the carbon dioxide already in the atmosphere. The development of alternative energy sources, which would cut reliance on fossil fuels is another possibility, and some progress has been made in this direction.

However, the most practical approach taken to the problem is to help man adapt to the changes that will take place in his environment and it's in this direction that most effort is now being made.

This article first appeared in Unesco Sources, *No. 1, pp. 9–10, February 1989.*

New UNESCO magazine

Unesco Director-General Federico Mayor: "Science must participate in everyday politics" (*Photo courtesy UNESCO/Dominique Roger.*)

The first issue of the new monthly magazine *Unesco Sources* was published in February. The magazine aims to help readers to get to know and understand the aims and actions of the United Nations Educational, Scientific and Cultural Organization (UNESCO).

The magazine includes an interview with Federico Mayor who was elected Director-General of UNESCO on 16 November 1987. In the interview, Mayor says:

> "The scientific community realizes that it must raise its voice, because, on the one hand, the problems of the world cross all borders, and on the other, science and technology can bring about irreversible changes. These two new facts, globality and irreversibility, prompt the scientific community to say to those who govern us 'be careful, take the following steps even if they appear to be very costly'.
>
> I believe that science must participate in everyday politics, and this participation by the scientific community will constitute the major event of the 21st century. Scientific skills have always been transformed into technology, and technology into an economic and political asset, but the scientific knowledge, as such, has remained in the background. With the new direction I aspire to it should become a necessary part of everyday political decisions".

The magazine also includes an article on global change entitled "Safeguarding our tomorrows" which discusses the Greenhouse Effect and the ozone threat. The article is reproduced on pages 145–146 of this issue of *CI*.

Swedish luminaries in the ranks of chemistry

Dr Levi Tansjö

Sweden, which is hosting the 32nd IUPAC Congress and the 35th IUPAC General Assembly this year, has produced many famous scientists — Arrhenius, Bergman, Berzelius, Rydberg and Scheele, for example. Dr Levi Tansjö of the Chemical Center, University of Lund, writes about these and other famous Swedish chemists upto 1900.

C. W. Blomstrand and the author, Dr Levi Tansjö, at the Chemical Center, University of Lund. Blomstrand said "Physicists ruin chemistry" when he heard about the Arrhenius theory of electrolytic dissociation.

There have been many Swedish luminaries in the ranks of chemistry both before and after 1900. Five of the most famous before 1900 were Torbern Bergman (1735–1784), Carl Wilhelm Scheele (1742–1786), Jöns Jacob Berzelius (1779–1848), Svante Arrhenius (1858–1927) and Johannes (Janne) Robert Rydberg (1854–1919).

Rydberg

Rydberg worked in Lund — where the 35th IUPAC General Assembly will take place. He was, like Arrhenius, a physicist but in his student years and throughout the rest of his life his principal interest was Mendeleev's periodic table of elements.

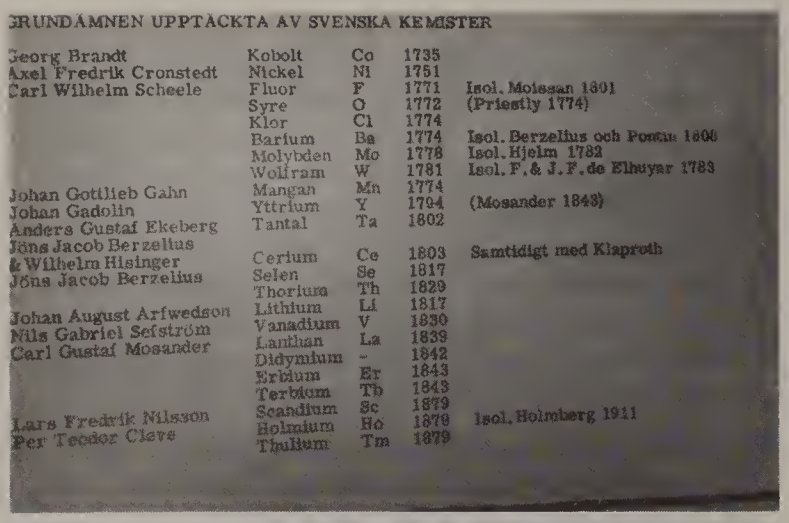
In 1897, when H. G. J. Moseley was 10 years old, Rydberg wrote[1]: "In investigations on the periodic system the ordinals (*Ordnungszahlen*) of the elements instead of the atomic weights should be used as independent variables".

Rydberg thought that since periods of 8 and 18 elements occur twice in the periodic system, a 2-element period should also occur twice. He therefore ascribed some spectral lines in the nebulae and in the corona to two hypothetical new elements between hydrogen and helium. He named these nebulium and coronium.

We know now that the lines in question are due to ionized atoms of known elements: the nebulae lines to ionized oxygen and nitrogen; the corona lines to very highly ionized iron.

Twenty elements discovered by Swedes

The fact that elements between hydrogen and helium are forbidden restricts the number of elements dis-


GRUNDÄMNEN UPPTÄCKTA AV SVENSKA KEMISTER

Georg Brandt	Kobolt	Co	1735	
Axel Fredrik Cronstedt	Nickel	Ni	1751	
Carl Wilhelm Scheele	Fluor	F	1771	Isol. Moissan 1891
	Syre	O	1772	(Priestly 1774)
	Klor	Cl	1774	
	Barium	Ba	1774	Isol. Berzelius och Pontin 1808
	Molybden	Mo	1778	Isol. Hjelm 1782
	Volfram	W	1781	Isol. F. & J. F. de Elhuyar 1783
Johan Gottlieb Gahn	Mangan	Mn	1774	
Johan Gadolin	Yttrium	Y	1794	(Mosander 1843)
Anders Gustaf Ekeberg	Tantal	Ta	1802	
Jöns Jacob Berzelius & Wilhelm Hisinger	Cerium	Ce	1803	Samtidigt med Klaproth
Jöns Jacob Berzelius	Selen	Se	1817	
	Thorium	Th	1829	
Johan August Arfwedson	Lithium	Li	1817	
Nils Gabriel Sefström	Vanadium	V	1830	
Carl Gustaf Mosander	Lanthan	La	1839	
	Didymium	-	1842	
	Erbium	Er	1843	
	Terbium	Tb	1843	
	Scandium	Sc	1879	
Lars Fredrik Nilsson	Holmium	Ho	1879	Isol. Holmberg 1911
Per Teodor Cleve	Thulium	Tm	1879	

Elements discovered by Swedish chemists: a display at the Berzelius Museum, Royal Academy of Sciences, Stockholm.

covered by Swedish chemists to 20. The first element discovered by a Swede was cobalt in 1735 and the last were scandium, holmium and thulium — discovered in 1879.

Anders Gustaf Ekeberg (1767–1813) at Uppsala discovered tantalum in 1802 and named it so because its oxide was supposed to be basic: "in the midst of the abundance of acid the oxide is incapable of taking anything of it up and become satisfied"[2]. He therefore recalls the Greek myth about Tantalus. In all the editions of M. W. Weeks' excellent book *Discovery of the elements* one reads: "because it had been such a tantalizing task to trace it down, Ekeberg named it tantalum"[3], which must be a misunderstanding.

Bergman

Sweden was placed on the chemistry map by students and workers at the laboratory of the Mines Office in Stockholm. From 1637 the office controlled Swedish mines and foundries, was responsible for the education of mining officials, and provided analyses for the Royal Mint.

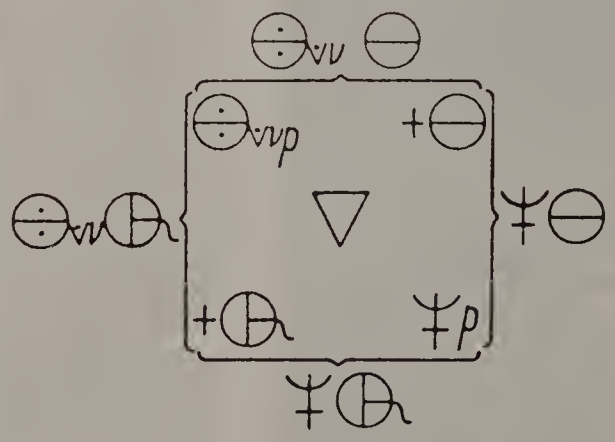
In 1750 the training of mining and mineral chemists was moved to the Philosophical Faculty at Uppsala where a chair in chemistry had been established. The professor, who also had to teach chemistry to medical students, was expected to give special consideration to the economic interests of the country.

When Bergman was appointed to the chair in chemistry at Uppsala in 1767 he had already worked successfully in mathematics, astronomy, physics and geography. He was appointed in spite of the fact that his qualifications in chemistry were documented with only one work — on the manufacture of alum — and Linnaeus had, for this reason, placed him second among the applicants. In a few years, however, Bergman amply justified his appointment both as a teacher and as an original investigator in chemistry and Uppsala became a place of pilgrimage for young chemists from many countries.

Bergman's most valuable contribution was in methods of analysis. He gave a full account of analysis by the blowpipe and distinguished between what was later called the oxidizing and reducing flames.

He developed procedures for qualitative and quantitative analysis of minerals by wet methods and showed that metals could be determined quantitatively by precipitation in a known compound without reducing them to metallic form. He was also a pioneer in classifying minerals by their chemical constitution rather than by their hardness, colour and crystalline form.

He brought together the vast knowledge of chemical reactions acquired in the course of his analytical work in his famous tables of affinity. The second edition in 1783 of his *Disquisitio de attractionibus*

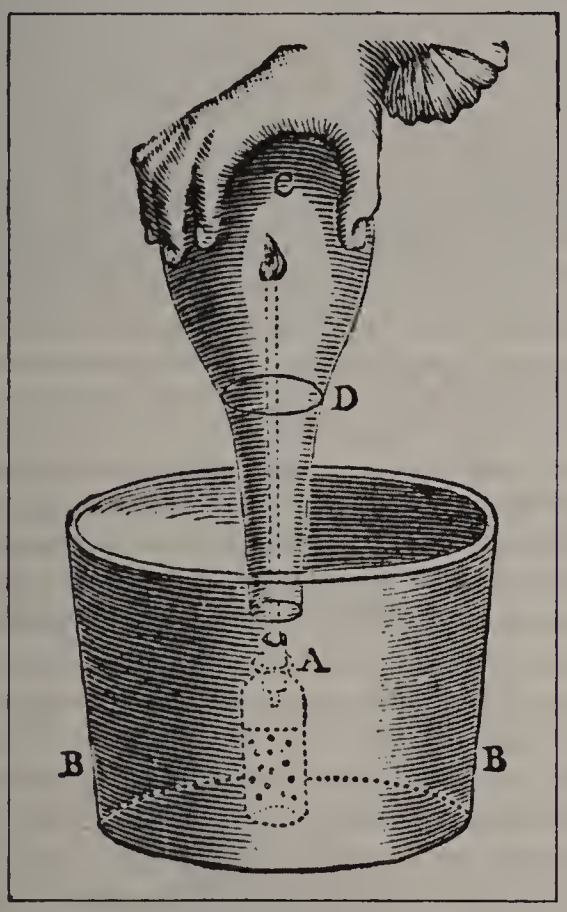


Torben Bergman and his representation in 1775 of the double decomposition of potassium sulphate with calcium chloride.

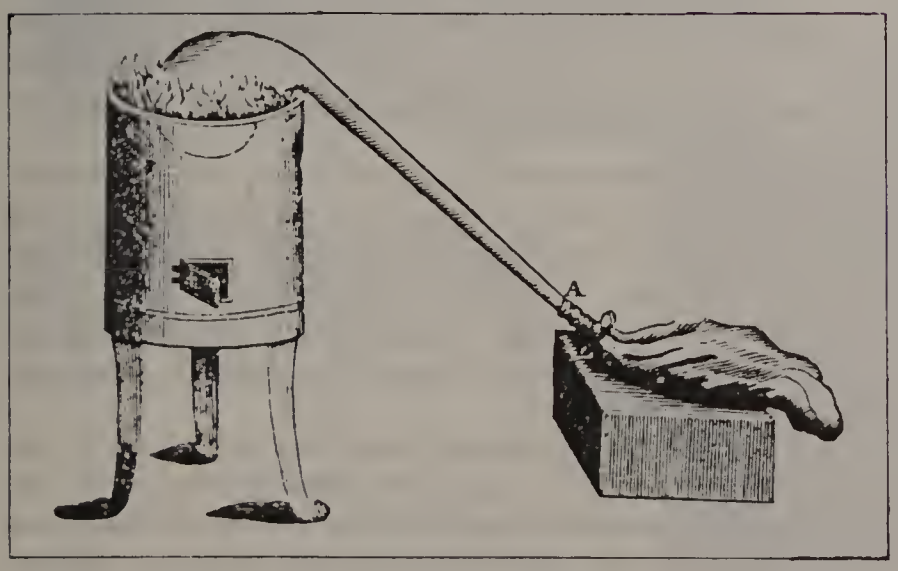
electivis contained a table with 59 columns representing reactions in the wet way and 43 in the dry way.

Bergman, like Scheele, adhered to the phlogiston theory although this was not too evident from his affinity tables. The tables were highly acclaimed long after Lavoisier had overthrown the phlogiston theory and were reprinted as late as 1808 in W. Nicholson's *Dictionary of chemistry*.

Throughout his career, Bergman was engaged in reforming chemical nomenclature and symbols and influenced Guton de Morveau in Dijon, who in 1787 became one of the authors of *Méthode de nomenclature chimique*.



Scheele's illustration of the combustion of hydrogen in air in 1777. The hydrogen was generated in bottle A, immersed in the tub of hot water B, and the hydrogen flame C burnt inside the flask D. The water rose in the flask.



Scheele's isolation of fire-air (oxygen).

Scheele

Scheele was an autodidact. At the age of 14 he left his native town of Stralsund in Pomerania (which belonged to Sweden 1648–1812 but is now part of GDR) to become an apothecary's apprentice at Gothenberg. He then held some subordinate positions in pharmacies using all his spare time to learn chemistry through reading, observation and experiment.

Carl Wilhelm Scheele.

Carl Wilhelm Scheele's
d. Königl. Schwed. Acad. d. Wissenschaft. Mitgliedes,
Chemiſche Abhandlung
von der
Luft und dem Feuer.
Nebſt einem Vorberichte
von
Torbern Bergman,
Chem. und Pharm. Prof. und Ritter; verſchied. Societ. Mitglied.
Upſala und Leipzig,
Verlegt von Magn. Swederus, Buchhändler; zu finden bey S. L. Cruſius.
1777.

Title page of Scheele's famous book about oxygen *Chemische Abhandlung von der Luft und dem Feuer*, published in 1777.

By 1770, when he appeared in Uppsala as an assistant in a pharmacy, he was already an accomplished scientist. He was introduced to Bergman who immediately realized his talents. The contact developed into a lifelong friendship and a fruitful collaboration. The British chemist Th. Beddoes wrote in 1786 that "the greatest of Bergman's discoveries was the discovery of Scheele"[4]. This trivial remark was long afterwards associated with Davy and Faraday.

In 1775 Scheele moved to run a pharmacy in the small town of Köping on Lake Mälaren, where he stayed for the rest of his life despite many offers of academic posts.

Scheele's discoveries

Scheele died in 1786 at the age of 44. In his short life, working in his spare time with limited equipment and facilities, Scheele's discoveries and studies included the following elements and compounds:

arsenic acid
arsenic hydride
barium oxide (baryta)
calcium tungstate (scheelit)
citric acid
chlorine
gallic acid
glycerol
hydrogen cyanide
hydrogen fluoride
hydrogen sulphide
lactic acid
malic acid
manganates
molybdic acid
nitrogen
oxalic acid
oxygen
permanganates
silicon tetrafluoride
tartaric acid
tungstic acid
uric acid

That Bergman and Scheele were held in high esteem also by their contemporaries is evident from the German chemist L. von Crell's obituary on Scheele in *Chemische Annalen* in 1787 which finished: "Thus, the world lost, in less than two years, two men, Bergman and Scheele, in whom Sweden, rich as it is in worthy scholars, could take special pride; two chemists who were loved and mourned, and whose memory a grateful world will never cease to venerate"[5].

The foundation of modern chemistry

In the late 1780s Lavoisier completed his revolution of chemistry and this year 1989 is the bicentenary of his *Traité élémentaire de chimie*, by which he swept away the phlogiston theory and laid the foundation of modern chemistry.

At the end of the first volume of Traité Lavoisier pointed out that the next important question must be to find the proportions in which elements combine and the proportions of the acid and the base in a salt. And he finished: "It is an immense task awaiting the young chemist. In finishing my own work, I should like to advise the men bold enough to take it up to work *bien* rather than *beaucoup* and to first ascertain the composition of the different acids before embarking on an investigation of their salts. Every structure intended to resist the ravages of time must have a solid foundation, and with chemistry in its present state its progress would be retarded by any research activity lacking in exactness and accuracy".

Berzelius

Berzelius was bold enough to accomplish the immense task single-handed with exactness and accuracy, most of it in a room, which he used as a laboratory in his three-room apartment at the corner of Nybrogatan and Riddaregatan in Stockholm.

Berzelius: "I sometimes interrupted my experiments, despairing of the possibility of reaching my goal, began them again with new hope, and suffered repeated frustration until I could see the light".

Afterwards he remembered: "I sometimes interrupted my experiments, despairing of the possibility of reaching my goal, began them again with new hope, and suffered repeated frustration until I could see the light. When one's mind is occupied by a certain idea which calls for much reflection, it allows no diversion. When I was together with others, when I was out walking, wherever I was, I compared in my mind the figures, which had become so familiar to me"[6].

Analytical methods of the precise sort he required were unknown: they had to be elaborated; there were no chemicals to buy: they had to be prepared; there were no utilities to buy: they had to be invented and produced; there was in all Sweden only one platinum crucible: it was too heavy for his best balance.

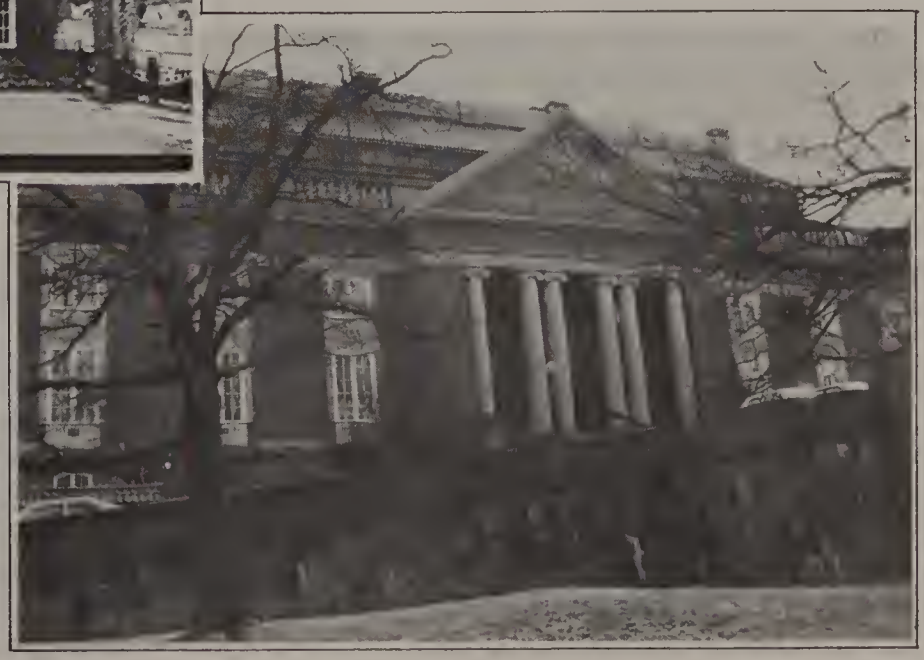
Nevertheless, after 10 years of almost ceaseless work the whole field was covered and as a supplement to the third volume of this textbook, he presented in 1818 the atomic weights of 43 elements and atomic formulas of 2000 compounds, that is, the whole of chemistry had been translated into the language of Dalton's atomic theory.

But that was not all. During those 10 years he wrote the first three volumes of his great, influential textbook, he introduced the atomic symbols we use, improved chemical nomenclature, discovered selenium, created a new mineral system and put forward his electrochemical or dualistic theory for chemical affinity.

Such achievements have their price and in the spring of 1818 "I all at once fell into an apathy"[7]. His physician recommended a long stay abroad. He set out for Paris via London and felt much better by the time

Berzelius

The backyard (left) of "The German Baker's House" (called so after an owner in the 17th century). A three-room apartment on the first floor of the building on the right was Berzelius' residence and laboratory during the period 1809–1818. The house was pulled down in 1907. (Right): Berzelius in his laboratory (a water colour by an unknown artist from about 1810).



The Berzelius Museum (left) at the Royal Swedish Academy of Sciences (right), Lilla Frescativägen 4, Stockholm. Berzelius was permanent secretary of the academy.

he reached Gothenberg. While in Paris he was appointed permanent scretary of the Swedish Academy of Sciences.

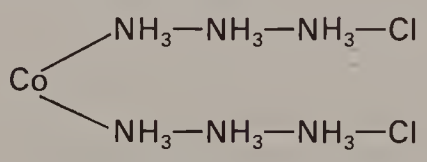
From 1821 onwards he then wrote annual reports on the progress of chemistry. Originally they were written only to be read at the annual celebrations of the academy, but they soon developed into volumes of 400–700 pages. They were translated into German and read by all chemists. These *Jahresberichte* enhanced the reputation of Berzelius still more and he was for a long period virtually the supreme authority in chemistry. His outstanding position fell off slowly with the decline of his powers and the increasing number of discoveries within organic chemistry, which he in vain tried to lodge in his dualistic theory.

Blomstrand

From 1818 chemists struggled to answer the question: why do some compounds exist whilst others do not? In the 1860s they found an answer in "The Theory of Valence".

Although Swedish chemists did not contribute to this theory Christian Wilhelm Blomstrand (1826–1897), Professor of Chemistry at Lund, is remembered for his bold attacks on Kekulé's dogma that valence is a "fundamental property of the atom, which is just as constant and unchangeable as its atomic weight"[8]. Blomstrand strove to establish a sound and complete theory of variable valence. He also established a chain theory for the constitution of metal-ammines and other complex compounds which held sway for roughly a quarter of a century until it was displaced by Alfred Werner's coordination theory.

Blomstrand wrote, for example, the structural formula for what we call hexaamminecobalt(II) dichloride in the following way:



All five editions of Werner's *magnum opus: Neuere Anschaungen auf dem Gebiete der anorganischen Chemie*, bear as a motto Blomstrand's words from 1869: "To explain molecular compounds atomistically, that is, from the saturation capacity of the elements, has become the main problem of modern chemistry"[9].

Blomstrand was growing old when he heard about the Arrhenius theory of electrolytic dissociation. His comment was: "Physicists ruin chemistry"[10].

Arrhenius

Arrhenius was a student of Uppsala but he did the experimental work for his doctoral thesis in Stockholm. Quite surprisingly, he found that on dilution of an electrolyte solution the resistance does not quite double when the dilution is doubled, even if the degree of dilution is high at the start.

Svante Arrhenius in the Physics Institute at the Stockholm Högskola (1901). (*Photo by Anton Blomberg, courtesy of the Stockholm City Museum.*)

He then suggested that an equilibrium exists between *active* (conducting) molecules of the electrolyte and *inactive* (non-conducting) ones and that active molecules are formed from inactive ones on dilution until, at extreme dilution, all of the electrolyte is active.

In March 1887, when he had read van't Hoff's papers on osmotic pressure published the year before, he perceived the way in which the active molecules differ from the inactive ones. "*Man kann sich mein enormes Glück vorstellen*"[11], he wrote much later about his feeling when he saw that conductivity data and data on freezing point depressions gave consonant values of the degree of dissociation for 78 electrolytes in 15 water solutions.

Two years later, in 1889, that is just 100 years ago, Arrhenius derived the Arrhenius equation:

$$k = Ae^{-E/RT}$$

This derivation required the same originality and ingenuity that he had demonstrated in his doctoral thesis in 1884[12].

All centuries come to an end. On 5 July 1900, a memorial lecture was delivered before the Chemical Society in London on Lars Fredrik Nilson (1840–1899), the discoverer of Mendeleev's eka-boron, that is scandium[13]. After the lecture, Sir William Ramsay said: "Sweden has indeed had excellent chemists in this century; it will be interesting to see if that will be the case in the next century too"[14].

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Officers and Bureau Members

The climax of the 35th IUPAC General Assembly in Lund will occur towards its end when the Council meets. One of the duties of Council will be to elect officers of the Union and members of Bureau. Nominations for the various positions that fall vacant in 1989 were required by the Secretary General at the IUPAC Secretariat before 16 June 1989. The following are details of candidates who had been nominated by the time this issue went to press (8 May).

President

Prof. Y. P. Jeannin (France)

Prof. Y. P. Jeannin, Vice-President and President-Elect, becomes President at the close of the Council meeting in Lund. He will hold office as President until the close of the Council meeting held at the next IUPAC General Assembly which will be held in Athens, Greece in 1991. A pen-portrait of Jeannin will appear in the next issue of *CI*.

Vice-President

The Vice-President to be elected at the 35th General Assembly will be President-Elect and will become President at the close of the Council meeting held at the 36th General Assembly in 1991. By 9 June, two nominations had been received.

Prof. E. Pungor (Hungary)

Prof. Ernó Pungor was born in 1923. He received his PhD degree at Pázmány Péter University in Budapest in 1949. The Hungarian Academy of Sciences awarded him a DSc degree in 1957.

In 1967 he was elected as corresponding member and in 1976 as full member of the Hungarian Academy of Sciences. He served as Professor of Analytical Chemistry at Eötvös Loránd University in Budapest and then at the University of Chemical Industry in Veszprém. At present he is Professor of Analytical Chemistry at the Technical University in Budapest.

His most important research has been accomplished in several analytical chemistry fields notably with the discovery of ion selective electrodes. He is the author of more than 500 papers and several books. He is the general editor of two journals, editorial board member of nine others and regional expert for one international scientific journal.

Pungor is the chairman of the Commission on Analytical Chemistry of the Hungarian Academy of Sciences and a member of a number of national and international scientific committees. He is an honorary member of the following academies and societies: Czechoslovak Academy of Sciences (1966), Egyptian Pharmaceutical Society (1973), Austrian Analytical and Microanalytical Society (1977), Chemical Society of Finland (1979) and the Analytical Chemical Society of Japan (1981).

He is an honorary doctor of the Technical University of Vienna and honorary professor of the Agricultural University of Lima. In addition, he is recipient of the Robert Boyle Gold Medal (1986), of the Talanta Gold Medal (1987), Gold Medals for Excellent Inventors (1976, 1979), Hungarian State Prize (1972), Gold Medal of the Hungarian Academy of Sciences (1988) and Gold Medal of the Technical University of Vienna (1988).

Pungor has served IUPAC since 1974 on several commissions and committees as an associate and titular member. He is currently a coopted member of the Analytical Chemistry Committee. He was editor of the *Multilingual Dictionary of Analytical Chemistry* and is Chairman of the Hungarian National Committee.

Prof. Tang You-qi (Chinese Chemical Society, Beijing)

Tang You-Qi (You-Chi) is Professor of Chemistry and Director of the Institute of Physical Chemistry, Peking University.

He received a bachelor's degree in chemistry from Tong-ji University in 1942 and a doctorate from California Institute of Technology, USA in 1950 where his dissertation dealt with structure and bonding in solids. He continued to do X-ray work on protein crystals until he accepted a teaching post offered by Qing-hua University in 1951. After a year he transferred to the Department of Chemistry at Peking University.

In the fifties, he gave new courses on crystallography and structural chemistry, at Peking University. He also did pioneering research work in this field and brought up the first group of structural chemists and crystallographers in China.

In 1971, his research group, in collaboration with a group from Academia Sinica, completed the determination of the structure of bovine insulin at a resolution of 2.5 Å. Following this his group began structural studies on petrochemical catalysts — in response to the needs of the country's newborn petrochemical industry. Ever since he has been actively engaged in both crystal- and surface-structural studies.

Tang is author of well over one hundred scientific papers and six well-received books on physical chemistry. He has received two national awards for natural science and four for science and technology.

Tang was elected to the membership of Academia Sinica in 1980, and to the Executive Committee of the International Union of Crystallography (IUCr) in 1984. He became President of the Chinese Chemical Society and Vice-President of IUCr in 1986 and 1987, respectively.

Recently, he was made Director of the National Beijing Laboratory for Structural Chemistry set up jointly by the Beijing Institute of Chemistry, Academia Sinica, the Department of Chemistry, Peking University and the Vice-Chairman of the Committee of Science and Technology, State Commission of Education.

Past-President

Prof. V. A. Koptyug (USSR)

The retiring President, Prof. V. A. Koptyug, remains a member of the Bureau for a period of two years. The Past-President is not an officer of the Union.

Secretary General

Prof. T. S. West (UK)

There is no vacancy for this office. At the Boston general assembly in 1987, Prof. T. S. West was re-elected as Secretary General for the period of 1987–1991.

Treasurer

There is no vacancy for this office. At the Boston general assembly in 1987, Prof. A. Björkman was re-elected for the period 1988–1991.

Bureau

The Bureau consists of the officers, the immediate past-president, the presidents of the divisions/sections, together with not less than 10 other members elected by Council. These are known as "elected members". At the conclusion of the 34th General Assembly in Boston, there were 11 elected members of the Bureau. At the 35th General Assembly the Bureau will make recommendations to Council as to the number of elected members (10 or more), who should be on the Bureau for the succeeding two years.

Ten elected members are elected for a period of four years and are eligible for election for a second period of four years. No adhering organization shall have more than one elected member of the Bureau. Statute 7.2 also states that "the principle of fair geographical representation of members shall be taken into account".

- *Elected members of Bureau, retiring in August 1989, who are not eligible for re-election, but may be nominated for another office:*

  Prof. A. D. Campbell (New Zealand)

- *Elected members of Bureau, retiring in August 1989, who are eligible for re-election for a further 4-year period:*

  Dr Mary L. Good (USA); Prof. W.-Y. Huang (Chinese Chemical Society, Beijing); Prof. S. Itô (Japan); Prof. I. Wadsö (Sweden).

- *Elected members of Bureau, who were elected at the 34th General Assembly until 1991:*

  Prof. A. J. Arvia (Argentina); Prof. M. T. Beck (Hungary); Prof. J. Jortner (Israel); Prof. G. Modena (Italy); Prof. N. Sheppard (UK); Prof. H. A. Staab (FRG).

At least four elected members of the Bureau must be elected at the 35th General Assembly in Lund, that is, the minimum number of 10 elected members less the six elected members who continue in office until 1991. By 8 May the following nominations had been received:

Prof. G. G. S. Dutton (Canada)

Prof. Guy G. S. Dutton is Professor of Chemistry at the University of British Columbia. He was born in London, UK, in 1923 and moved to Canada in 1949. He is now a Canadian citizen. His first two degrees are from Cambridge and London, UK, and his PhD is from Minnesota, USA.

During the 1960s his research was on wood chemistry and his PhD thesis represents the first structural study of coniferous hemicelluloses. In 1965 he spent a year at the Ecole Française de Papetene in order to introduce a research programme on polysaccharides found in wood and their influence on pulping. He was awarded a NATO lectureship in 1968 at the Max Planck Institute for Immunobiology, Freiberg and, as a result, has for the past 20 years studied the immunochemistry of bacteria.

Dutton is the author of more than 100 publications, including chapters in several books. In 1989 he will receive The John Labatt Limited Award for his achievements in the field of biochemical research.

He has been involved in the organization of regional and national chemistry meetings in Canada and also the 28th IUPAC Congress held in Vancouver in 1981 and the 12th International Carbohydrate Symposium in 1982. He is currently Vice-Chairman of Pacifichem '89, a congress to which all chemists and chemical engineers in countries bordering the Pacific are invited.

Dutton has served on the executive of the Carbohydrate Division of the American Chemical Society and was elected President of the Chemical Institute of Canada in 1988. He was appointed to the Canadian National Committee for IUPAC following the 1981 IUPAC Congress and was a Canadian delegate to the IUPAC general assemblies in Lyngby, 1983 and Lyon, 1985. He will be a member of the Canadian delegation at Lund.

Dr M. L. Good (USA)

Dr Mary Good was born in Grapevine, Texas, USA in 1931 and studied at the University of Central Arkansas, obtaining her BSc in Chemistry in 1950. She was awarded her MSc in 1952 and PhD in 1955 by the University of Arkansas, Fayettville for research in inorganic and radiochemistry.

She started to teach chemistry at Louisiana State University, Baton Rouge in 1954 and became an assistant professor in 1958. In 1961 she became Professor of Chemistry in New Orleans and, in 1974, Boyd Professor — a distinguished professorship. She moved back to Baton Rouge in 1979 as Boyd Professor of Materials Science, in the College of Engineering.

Good's scientific research activities were largely concerned with the solution of chemical or structural problems by various spectroscopic techniques — the characterization of species in solution or in solid materials. She is the author of about 100 articles in refereed technical journals and has received many honours, awards and medals.

In 1980, Good left the academic world for the industrial world joining UOP Inc. in Des Plaines, Illinois, as Vice President–Director of Research. From 1986 to 1988 she was President-Engineered Materials Research, Allied-Signal Inc. and is now Senior Vice-President–Technology.

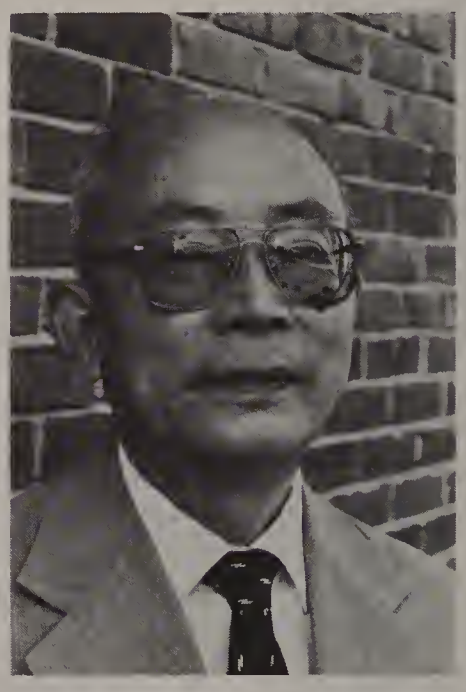
Good was President of the American Chemical Society in 1987 and Chairman of the US National Science Board in 1988. She is also a member of the Board of Directors of the Industrial Research Institute

LUND

and the Board of Trustees, Rensselaer Polytechnic Institute.

Good was elected directly as Vice-President of the IUPAC Inorganic Chemistry Division in 1979 and became President in 1981 for a four-year term. In 1985, she was elected to Bureau for the period 1985–1989 and has been re-nominated by the US National Committee for IUPAC for the period 1989–1993.

Prof. W.-Y. Huang (Chinese Chemical Society, Beijing)



Prof. Huang Wei-yuan was born in 1921. He obtained a BSc from Fukian Christian University in 1943, his MSc from Lingnan University, Canton in 1949 and his PhD from Harvard University in 1952.

In 1982 he received the National Prize for Natural Sciences and was twice awarded the National Prize for Scientific Invention — in 1965 and 1981, respectively. He was also twice awarded the National Prize of Military Sciences and Technology in 1979.

His major research interests and publications cover organofluorine chemistry, chemistry of natural products and organoboron chemistry: he has over 70 publications to his name. Huang is Vice Editor-in-Chief of *Acta Chimica Sinica* and a member of the International Advisory Board of *Heilbron Dictionary of Organic Chemistry*. He is a member of Academia Sinica, Vice-President of Shanghai Branch Academia Sinica and Director of the Shanghai Institute of Organic Chemistry.

Huang has been active in IUPAC as National Representative and coopted member of the Organic Chemistry Division. In 1985, he was elected to Bureau for the period 1985–1989 and has been re-nominated by the Chinese Chemical Society for the period 1989–1993.

Prof. S. Itô (Japan)

Prof. Shô Itô was born in December 1924 in Tokyo, Japan. He was awarded his B Pharm. at the Chiba College of Pharmacy in 1944, and his BSc in chemistry and DSc at Tohoku University, Sendai, in 1950 and 1957, respectively.

He was appointed assistant at Tohoku University in 1956, associate professor in 1962 and professor in 1965. He moved to Tokushima Bunri University in 1988 and now serves as Dean of Pharmaceutical Sciences.

Prof. Itô is interested in research in natural product chemistry, for example, the elucidation of the structure and synthesis of terpenoids and alkaloids, in synthetic methodologies; chiral induction in acyclic systems; and in novel aromatic chemistry, for example, the synthesis, physical properties and reactions of troponoids, azulenoids, annulenes and phanes.

He is on several editorial boards and served as Dean of the Faculty of Science at Tohoku University.

Itô became a member of IUPAC's Division of Organic Chemistry Committee in 1973. He became the Division Secretary in 1975, Vice-President in 1977 and President in 1981. In 1985 he was elected in Bureau and in 1987 became a member of the Executive Committee.

Dr P. Kratochvíl (Czechoslovakia)

Dr Pavel Kratochvíl was born in Prague in February 1930. He is currently Chief Research Fellow (Research Professor), Head of the Department of Physical Chemistry of Polymers and Head of the Laboratory of Molecular Parameters at the Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Prague.

In 1953 he became a Master of Engineering at the University of Chemical Technology in Prague. Until 1957 he was Lecturer on physico-chemical principles of technological processes in the Department of Organic Technology at the university. Kratochvíl obtained his PhD in 1960 at the Institute of Macromolecular Chemistry with a thesis on the study of the mechanism of heat denaturation and aggregation of albumin. Since then he has remained at the Institute. His main field of activity is physical chemistry of polymers, particularly the investigation of solution properties of polymers and copolymers and light scattering from polymer solutions.

In 1968 he received a DSc at the Institute for a thesis on complicated systems of macromolecules in dilute solutions. Since 1969 he has also been adjunct professor of physical chemistry of polymers at the University of Chemical Technology.

Kratochvíl is the author of about 140 papers on physical chemistry of polymers and particularly polymer solutions. He has also presented 10 invited lectures at major international meetings and over 150 communications at other international scientific meetings.

In 1970, the President of Czechoslovakia conferred on him the National Prize for Science and in 1977 he received the Prize of the Czechoslovak Academy of Sciences.

Kratochvíl became an observer of IUPAC's Commission on Macromolecular Nomenclature in 1977, a titular member in 1979 and chairman in 1985. Since 1985 he has also been a member of the Interdivisional Committee on Nomenclature and Symbols (IDCNS). He has been closely involved in various IUPAC-sponsored meetings in Prague including the International Symposium on Macromolecules in 1965 and many of the Prague meetings on macromolecules (30 microsymposia and 10 discussion conferences) over the last 20 years.

Prof. M. Mandel (Netherlands)

Prof. Michel Mandel was born in Antwerp, Belgium in 1926. He started his education in chemistry at the Free University of Brussels in 1945 and obtained a *Licencié en sciences chimiques* in 1949 and PhD in chemistry in 1955. In 1985 he received an honorary PhD from the Faculty of Sciences, University of Uppsala, Sweden.

From 1949 to 1958 he was Instructor at the Laboratory of General and Analytical Chemistry, Free University of Brussels and then from 1958 to 1961 he was Lector (Associate Professor) of Physical Chemistry, Leiden University where he was Director of the Laboratory of Inorganic and Physical Chemistry from 1962 to 1970 and twice dean of the Department of Chemistry.

Since 1961 he has been part-time Professor of Physical Chemistry, Free University of Brussels. His current teaching activities cover the physical chemistry of macromolecules and polyelectrolytes, physical chemistry of electrolyte solutions and the theory of dielectric properties.

His present research activities include experimental and theoretical investigations of the physical behaviour of solutions of polymers, in particular polyelectrolytes, involving both classic and more sophisticated techniques. He is the author or co-author of more than 130 scientific publications in scientific journals or contributions to scientific books on physical chemistry and principal editor of the journal *Biophysical chemistry*.

Mandel was a guest professor at the Weizmann Institute of Science, Israel in 1966, at the Faculty of Sciences, University of Trieste, Italy, in 1974 and at the Faculty of Sciences, Catholic University of Leuven, Belgium in 1988.

Prof. Mandel has been active in IUPAC since 1971 when he was chairman of the Netherlands delegation to the IUPAC Council meeting. He has also been national representative, coopted member and titular member of the Macromolecular Division (1981–1985). At present he is chairman of the IUPAC Commission on Polymer Characterization and Properties.

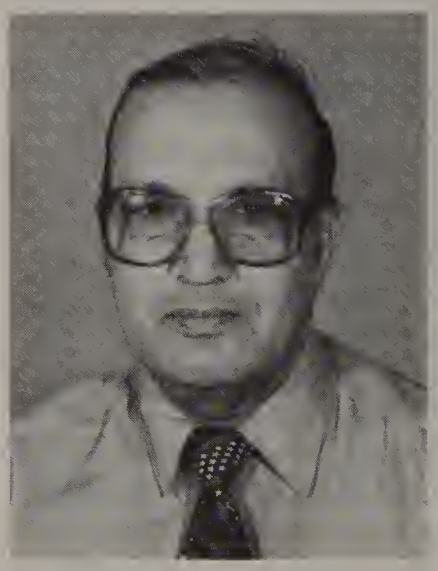
Prof. Sang-Up Choi (Republic of Korea)

Sang-Up Choi is Professor-Emeritus at Sogang University, Seoul, Republic of Korea. He was born in April 1922 and received his education in Kyoto, Japan. After receiving a BSc in chemistry he went to Purdue University, USA where he obtained a PhD in chemistry in 1957.

From 1945 to 1960 he was successively instructor, assistant professor and then associate professor at Seoul National University. In 1961 he became professor at Yonsei University and in 1963 professor at Hanyang University. In 1968 he moved on to Sogang University as Professor of Chemistry later becoming Dean of the Graduate School and then, from 1973 to 1979, Vice President of the university.

Sang-Up Choi has been Secretary General, Vice-President and President of the Korean Chemical Society and President of the Federation of Asian Chemical Societies. He is a member of the Korean National Assembly (Parliament) and a member of the Korean National Academy of Sciences. He was a member of the Korean delegation to the IUPAC General Assembly in Boston. Sang-Up Choi has also been responsible for distributing IUPAC provisional recommendations to chemists in the Asian region.

Prof. M. M. Taqui Khan (India)



Prof. Taqui Khan has been Director of the Central Salt and Marine Chemicals Research Institute, Bhavnagar since 1983. From 1952 to 1966 and 1970 to 1982 he was associated with Osmania University as Lecturer, Professor, Principal and Head of the Chemistry Department. He was also Associate Professor at the Indian Institute of Technology, Madras from 1968 to 1970.

Taqui Khan graduated from Madras University and then did post-graduate work at Osmania University. He then went to Clark University, Worcester, Massachusetts to do a PhD on coordination chemistry with Prof. A. E. Mortell.

Taqui Khan's research has centred on ternary complexes of 3*d* metal ions with purine and pyrimidine bases, nucleosides and nucleotides and particularly the aqueous chemistry of the ruthenium(III) ion and its complexes with aminopolycarboxylicacids especi-

ally EDTA in solution.

Twenty seven students have received their PhD degrees under his guidance at IIT, Madras, Osmania and Bhavnagar University. About 10 students are doing their PhD work at present in Bhavnagar. Taqui Khan has published monographs on homogeneous catalysis by metal complexes and about 150 research papers. He has received international recognition as a lecturer at conferences, has three patents and is a Fellow of the Indian Academy of Sciences.

Prof. B. I. Wadsö (Sweden)

Prof. B. Ingemar Wadsö was born in 1930. He obtained a BA from the University of Lund in 1950 and a PhD in Chemistry in 1962.

In 1970 he received the Arrhenius plaquette from the Swedish Chemical Society and in 1979 the Huffman Memorial Award at the US Calorimetry Conference. In 1984 he received the award for "Applied Chemical Thermodynamics" from the Swiss Society for Thermal Analysis and Calorimetry.

From 1974–81 he was Research Professor of the Swedish Natural Science Research Council, University of Lund and since 1981 has been Professor of Thermochemistry at the same university.

His research has been primarily concerned with instrument and method development in thermochemistry, particularly microcalorimetry, and also the thermodynamics of aqueous solutions and biochemical and biological systems. He has published about 175 scientific papers — mainly in thermochemistry.

Wadsö became involved in the work of IUPAC in 1967 when he joined the Commission on Thermodynamics (I.2). He was a titular member from 1973–81 and since 1981 has been a coopted member of IUPAC's Physical Chemistry Division Committee. From 1985–87 Wadsö was chairman of the IUPAC working party on biophysical chemistry and since 1987 has been chairman of the Steering Committee on the same topic.

He was elected a member of the IUPAC Bureau in 1985 and has been renominated for a further four-year period by the Swedish National Committee for Chemistry.

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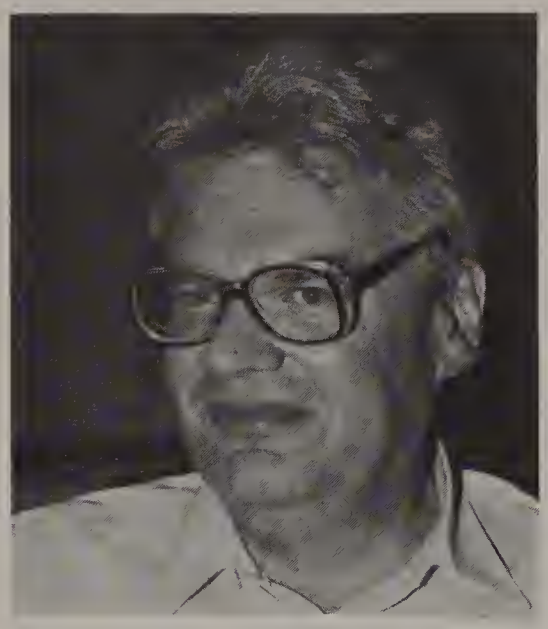
Prof. K. I. Zamaraev (USSR)



Prof. Kirill Zamaraev was born in Moscow in 1939. He graduated from the Moscow Physico-Technical Institute in 1963. From 1963–77 he was at the Institute of Chemical Physics, USSR Academy of Sciences, first as a post-graduate student and then as junior research fellow, senior research fellow and finally chief of laboratory.

He obtained a candidate degree in chemistry in 1966 and a doctorate in 1972. In 1977 he became Deputy Director and in 1984 Director of the Institute of Catalysis, Siberian Branch of the USSR Academy of Sciences, Novosibirsk where he is also Professor of Physical Chemistry. He became a Corresponding Member of the USSR Academy of Sciences in 1976 and a Full Member in 1987.

Zamaraev's main fields of scientific interest are chemical kinetics in condensed media, catalysis, photochemistry and magnetic radiospectroscopy. He is the author of over 150 publications and editor-in-chief of the journal *Reaction kinetics and catalysis letters*. He is also a member of the editorial boards of the *Journal of molecular catalysis, Catalysis letters, Catalyst review* and *Catalysis today*.

Zamaraev has been actively involved with IUPAC for more than 20 years. From 1967–71 he was scientific secretary of the National Committee of Soviet Chemists and was vice-chairman of the committee from 1971 to 1977. He has participated in IUPAC-sponsored conferences and has been an official delegate of the USSR at IUPAC Council meetings. He is currently President of the Physical Chemistry Division.

Council agenda — LUND

The following is the agenda for the 35th IUPAC Council Meeting to be held in Lund, Sweden: 16–17 August 1989.

1. Introductory remarks and finalization of agenda
2. Approval of minutes of 34th Council Meeting and matters arising
3. Announcement of nominations for officers and Bureau members
4. Announcement of time of elections
5. Statutory Report of President on State of Union
6. Report of Finance Committee
7. Biennial Report of Treasurer and accounts for 1987–88/Appointment of auditors for 1990–91
8. Reports of division presidents
9. Report of Publications Committee
10. Report of CHEMRAWN Committee
11. Report of Committee on Chemistry and Industry
12. Report on affiliate membership scheme
13. Proposed changes to byelaws
14. Continuation/dissolution of existing IUPAC bodies proposals for new bodies
15. Proposals formally received from national adhering organizations
16. Ratification of dates and places of 36th IUPAC General Assembly and 33rd IUPAC Congress
17. Budget proposal for 1990–91 and national subscriptions for 1990–91
18. Important matters discussed by Bureau at 35th General Assembly not covered by items on Council agenda
19. Elections
20. Provisional places of 37th General Assembly and 34th Congress (1993)
21. Applications for membership of IUPAC
22. Applications for Associated Organization status and review of existing Associated Organizations
23. Adoption of recommendations on nomenclature and symbols
24. Ratification of decisions taken by Bureau and Executive Committee since 34th General Assembly
25. Any other business (discussion only)

For September read August

The pre-meeting information booklet sent to participants at the 35th IUPAC General Assembly to be held in Lund, Sweden 9 to 17 August includes details of guided tours and excursions. On pages 17–18 of the booklet various dates in September are given for these tours and excursions. Participants will be relieved to learn that they will not have to wait a month for these excursions. The dates stated actually apply to the month of August.

Conferences

Vapour–liquid equilibria

Trieste, Italy

6–8 September 1989

IUPAC SPONSORED

The 5th International Workshop on Vapour–Liquid Equilibria in 1-Alkanol + n-Alkane Mixtures will be held in the Gradisca d'Isonzo International Centre for Applied Sciences, Trieste. The workshop is being organized by the Instituto di Chimica Applicata e Industriale and the University of Trieste.

The scientific programme includes the following lectures:

- Final report on vapour pressures and heats of vaporization of 1-alkanols + n-alkanes (K. Aim, Czechoslovakia).
- Some remarks on simple association (U. K. Deiters, FRG).
- Theory of alkanol–alkane mixtures (K. E. Gubbins and K. Johnson, USA).
- Modelling of VLE and LLE in alkanol–alkane mixtures (D. Lempe, DDR).
- VLE and density correlations for 1-alkanol + n-alkane mixtures (B. C-Y. Lu, Canada).
- The critical properties of alkanes and alkanols (A. S. Teja, USA).

Contributed papers — including poster communications which will be discussed in a specially organized session — will cover the following topics:

1. Experimental measurements.
2. Data compilation and evaluation.
3. Correlation and prediction methods for the thermophysical properties of 1-alkanols and n-alkanes (second virial coefficients, orthobaric densities, vapour pressures, heat capacities, enthalpies of vaporization) and their binary mixtures (excess properties, activity coefficients at infinite dilution, LLE, VLE and SLE).

There will be an afternoon dedicated to microcomputer presentations, and an exhibition of chemical equipment.

The workshop will be conducted in English. The registration fee is USD 150. This entitles the registrant to participate in the scientific and social programmes and to an extended abstracts volume. Affiliates are entitled to a 10% reduction of the registration fee.

The IUPAC workshop will follow the 4th CODATA Symposium on Critical Evaluation and Prediction of Phase Equilibria in Multicomponent Systems (4–6 September). The registration fee for both meetings is USD 220.

Accommodation is available in hotels located at Gradisca d'Isonzo or in Grado, famous for its beach, which is a 10 minute drive away. The room rates per night range from USD 30 to USD 50. Full board is available from USD 40 to USD 70.

The area around Gradisca has many reminders of the Roman age and the Republic of Venice. A visit to Aquileia gives the impression of life during the Roman period, with its port, Roman houses and a fantastic

basilica with mosaics. The ancient Venetian way of life can also be discovered in Grado. A visit to Trieste, Udine, Gorizia and Cividale will show the importance of the area in Roman times and during the Austrian Empire of the last century.

The climate in Trieste at the time of the workshop is mild with an average temperature of about 25°C. Swimming is pleasant along the beaches of Grado and Trieste.

Nitroxide radicals
Novosibirsk, USSR
18–22 September 1989

IUPAC SPONSORED

The International Conference on Nitroxide Radicals (ICNR–89) will be held at Akademgorodok (Academic City), Novosibirsk. It is organized by the Institutes of Organic Chemistry, Inorganic Chemistry, and Chemical Kinetics and Combustion of the Siberian Division of the Academy of Sciences.

The conference will cover various aspects of synthesis, reactions, magnetic and other physical properties, spectroscopy, and applications of free nitroxide radicals in science, medicine and industry. The scientific programme will consist of invited plenary lectures, poster sessions and 15-minute short communications in two parallel subsections: synthesis and chemistry; spectroscopy, magnetic properties and applications (molecular biology, medicine etc.).

The following scientists have agreed to present lectures: H. G. Aurich (FRG); P. Balgavy (Czechoslovakia); T. Endo (Japan); A. R. Forrester (UK); K. Hideg (Hungary), K. U. Ingold (Canada); E. G. Janzen (Canada); J. F. W. Keana (USA); G. R. Luckhurst (UK); M. J. Perkins (UK); E. G. Rosantsev (USSR); G. Sosnovsky (USA); and Xi-Kui-Jang (China).

The official conference languages will be Russian and English. Simultaneous translation from Russian into English and *vice versa* will be provided.

Akademgorodok, which is about 38 km from Novosibirsk, is a world famous scientific centre where international conferences and symposia are regularly held. There are about 28 research institutes here, including five chemical institutes. The city is surrounded by birch and pine forests and lies on the shore of an artificial lake "Ob Sea".

Participants will be accommodated at the Golden Valley Hotel which is located within walking distance of the House of Scientists where the conference will be held. An informal mixer on the first evening and excursions to Akademgorodok institutes will be available to all participants and accompanying persons.

Novosibirsk Akademgorodok (Academic City), Siberia, USSR, venue of the International Conference on Nitroxide Radicals, 18–22 September 1989.

The proceedings of the conference will be published in a special volume prior to the conference. Participants will be provided with a volume of abstracts upon registration.

Travel arrangements for participation at the conference, as well as for a possible extended stay in Moscow or participation in a post-conference tour of Baikal can be arranged through local tourist offices cooperating with the Soviet Travel Agency (Intourist).

Electrochemistry

Kyoto, Japan
17–22 September 1989

IUPAC SPONSORED

The 40th Annual Meeting of the International Society of Electrochemistry (ISE) will be held at the Kyoto International Conference Hall. The main theme of the meeting is electrochemistry for new materials and high technology.

The scientific programme of the meeting will consist of plenary lectures and oral presentations. Four symposia are planned:

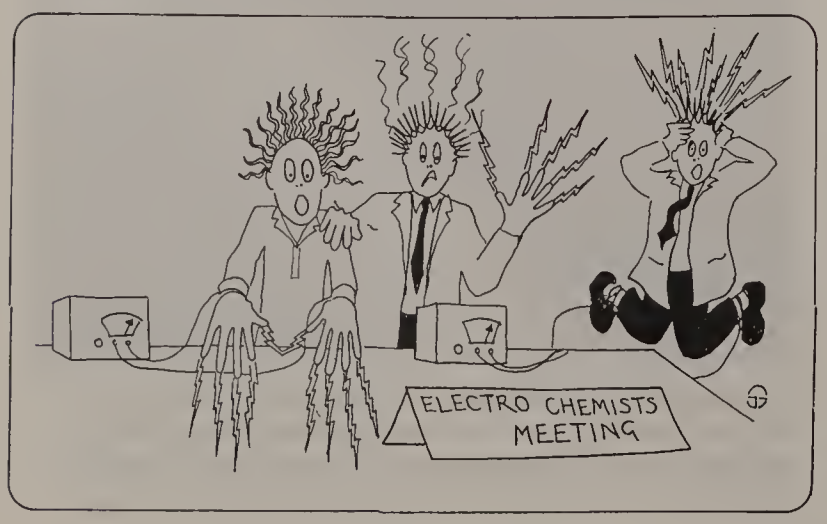
1. New materials
2. High technology
3. Fundamentals
4. Fundamental and applied electrochemistry in related to "Scientific Divisions of ISE".

Plenary lectures will be given by R. C. Alkire (USA); A. J. Appleby (USA); A. J. Bard (USA); H. Gerischer (FRG); K. Honda (Japan); J. Koryta (Czechoslovakia); R. A. Marcus (USA); and T. Sekimoto (Japan, tentative).

The official language of the meeting is English. No simultaneous interpretation will be provided.

Kyoto was the ancient capital of Japan for more than 10 centuries from 794–1867. It is the cradle of Japanese culture and the spiritual home of the Japanese in an area of picturesque mountains and placid waters. The temperature in Kyoto during the meeting period is likely to range from 18°C at night to 28°C in the daytime with an average humidity of about 75%. Summer clothing is therefore recommended.

The registration fees for the meeting are JPY 50 000; JPY 20 000 for students and JPY 15 000 for accompanying persons.



Organometallic chemistry directed towards organic synthesis

Florence, Italy
1–6 October 1989

IUPAC SPONSORED

The 5th IUPAC Symposium on OrganoMetallic Chemistry directed towards Organic Synthesis (OMCOS-V) follows previous meetings in Fort Collins (1981), Dijon (1983), Kyoto (1985) and Vancouver (1987). OMCOS-V will be held in Florence's "Palazzo dei Congressi", a very modern structure able to host up to 1000 people in its main conference room.

After the official opening ceremony, there will be alternate plenary and invited lectures of general interest and short oral presentations. In addition, a poster session is planned each day. The four main topics of OMCOS-V will be:

A. Synthesis of molecules of biological interest *via* organometallics.
B. Metallo-enzymes in organic synthesis.
C. Synthesis of "fine chemicals" *via* organometallics.
D. Selective synthetic processes mediated by organometallic compounds.

There will be nine plenary lectures:

- Asymmetric synthesis made easy (H. C. Brown, USA).
- Metallo imines: useful reagents in organic synthesis (G. Cainelli, Italy).
- Selective biomimetic catalysis with metalloporphyrins (J. T. Groves, USA).
- Chromium carbene complexes in the synthesis of molecules of biological interest (L. S. Hegedus, USA).
- Specific reactions of organotransition metal complexes with unsaturated hydrocarbons (H. Lehmkuhl, FRG).
- Coordination compounds as molecular devices (J. M. Lehn, France).
- Organometallic methodologies for prostaglandin synthesis (R. Noyori, Japan).
- Asymmetric organometallic catalysis: an outlook after 35 years of remarkable development (P. Pino, Italy).
- Structure–reactivity relationship in organometallic reagents (D. Seeback, Switzerland).

The official language of the symposium is English. No translation facilities will be available.

The registration fees are ITL 400 000 for active participants, ITL 230 000 for student members and ITL 200 000 for accompanying persons. Each active participant will receive a volume containing all lecture and poster abstracts. The plenary and invited lectures will be published in *PAC*.

Hotel accommodation will be available at rates ranging from ITL 45 000 to ITI 200 000 for a single room. A limited number of rooms will also be available

in the student hall of residence at a cost of ITL 150 000 for the duration of the symposium. A number of social events have been arranged including a get-together, organ concert, excursions and dinners.

Florence is famous for its unique art treasures, magnificent historical buildings and famous museums and galleries. It is set in one of the most beautiful regions of the Italian peninsula. The city is an old and large academic centre with faculties of sciences, medicine, literature, law and architecture. The university is mainly concentrated in the historical part of the city.

ESOC-6 date change

The 6th European Symposium on Organic Chemistry (ESOC-6) will now be held in Belgrade, Yugoslavia on 10–15 September 1989 and *not* 3–8 September as previously announced (see page 39, January 1989 issue of *CI*).

Separation science and technology

The 2nd International Conference on Separation Science and Technology will be held in Hamilton, Ontario, Canada, 1–4 October 1989. The conference will take place concurrently with the 39th Annual Conference of the Canadian Society for Chemical Engineering.

For further information, please contact: Dr V. Lakshmanan, Ontario Research Foundation, Mississauga, Ontario L5K 1B6, Canada.

Silicon and tin conference

The 1st ANAIC International Chemical Conference on Silicon and Tin will be held at the University of Malaya, Kuala Lumpur, 23–26 October 1989. ANAIC is the Asian Network for Analytical & Inorganic Chemistry.

The conference will cover the following areas:

- New insights into chemical synthesis, reactivity and structure.
- Applications in catalysis and solid state chemistry.
- Polymers and materials science applications.
- Biological effects.
- Advances in analytical detection.

For futher information contact: Prof. V. G. Kumar Da, Organizing Chairman, 1st ANAIC International Chemical Conference on Si & Sn, c/o The Institute of Advanced Studies, University of Malaya, 59100 Kuala Lumpur, Malaysia. Tel: +60 (3) 7571066/7555466 (Ext. 204). Fax: +60 (3) 7573661. Telex: UNIMAL/MA 39845. Cable: UNIVSEL.

Polymer blends

Polymer blends — '89 will be held 30–31 October 1989 at the Industrial Materials Research Institute in Boucherville, Quebec, a suburb of Montreal. The meeting will feature about 20 speakers gathered from industry, academia, and government, specializing in polymer blend research.

For further information, please contact: Dr B. D. Favis, Industrial Materials Research Council Canada, 75 De Mortagne Blvd, Boucherville, Quebec, Canada J4B 6Y4. Tel: +1 (514) 641 2280. Fax: +1 (514) 641 4627.

Physiology of immobilized cells

An International Symposium on Physiology of Immobilized Cells will be held in Wageningen, The Netherlands, 10–13 December 1989. The aim of the symposium is to evaluate the potential and stimulate interest in the physiology of immobilized cells for biocatalytic processes.

For further information contact: J. A. M. de Bont, Agricultural University, Division of Industrial Microbiology, Dept of Food Science, PO Box 8129, 6700 EV Wageningen, The Netherlands.

Pacific Basin Chemical Congress

The 1989 International Chemical Congress of Pacific Basin Societies will be held in Honolulu, Hawaii, USA, during the week of 17–22 December 1989. The congress is sponsored by The Chemical Society of Japan, The Canadian Society for Chemistry, and the American Chemical Society.

The congress scientific programme will cover the entire spectrum of chemical research and development: agrochemistry; analytical chemistry; applied chemistry; bioscience and technology; inorganic chemistry; information transfer; macromolecular chemistry; organic chemistry, and physical chemistry. The congress is open to chemists in countries outside the Pacific Basin who may wish to submit papers for consideration and to attend.

Persons in Japan contact: Mr Hiroshi Hamada, Executive Director, The Chemical Society of Japan, 1–5, Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan. Tel: 03-292-6161. Telex: 0226198 CSJ J. Facsimile: 81-3-292-6087.

Persons in Canada contact: Dr Anne E. Alper, Executive Director, The Chemical Institute of Canada, 1785 Alta Vista Drive, Ottawa, Ontario K1G 3Y6. Canada. Tel: (613) 526-4652. Facsimile: (613) 738-5056.

All others contact: Mr Gordon Bixler, Secretary, Pacifichem '89 Organizing Committee, American Chemical Society, 1155 Sixteenth Street, NW Washington DC 20036, USA. Tel: (202) 872-8069. Telex: 440159 ACSP UI. Facsimile: (202) 872-4615 or (202) 872-8727.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in brackets.

1989

Coordination chemistry

2–7 July. International Conference on Coordination Chemistry. Queensland, Australia.
(XXVII ICCC, UniQuest Limited, University of Queensland, St Lucia, Queensland 4067, Australia.)

Phosphorus chemistry

3–8 July. 11th International Conference on Phosphorus Chemistry. Tallinn, USSR.
(ICPC-1989, Tallinn Technical University, Ehitajate Tee 5, Tallinn 200108, USSR.)

Polymer blends

17–20 July. 32nd Microsymposium on Macromolecules: "Polymer Blends". Prague, Czechoslovakia.
(32nd Microsymposium, PMM Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 162 06 Prague, Czechoslovakia.)

Bioinorganic chemistry

24–28 July. 4th International Conference on Bioinorganic Chemistry. Cambridge, Massachusetts, USA.
(Prof. K. D. Karlin, Chairman. ICBIC-4, Department of Chemistry, SUNY at Albany, Albany, NY 12222, USA.)

Analytical chemistry

30 July–5 August. SAC 89: International Conference on Analytical Chemistry. Cambridge, UK.
(Miss P. E. Hutchinson, Secretary of the Analytical Division, Royal Society of Chemistry, Burlington House, London W1V 0BN, UK.)

IUPAC Congress

2–7 August. 32nd IUPAC Congress. Stockholm, Sweden.
(IUPAC c/o Stockholm Convention Bureau, Box 6911, S-102 39 Stockholm, Sweden.)

Solution chemistry

6–11 August. 20th International Conference on Solution Chemistry. Jerusalem, Israel.
(The Secretariat, 20th ICSC Conference, PO Box 50006, Tel Aviv 61500, Israel.)

IUPAC General Assembly

9–17 August. 35th IUPAC General Assembly. Lund, Sweden.
(The IUPAC General Assembly is not open for general participation but restricted to members of IUPAC bodies that meet on this occasion.)

Heterocyclic chemistry

13–17 August. 12th International Congress of Heterocyclic Chemistry (ICHC). Jerusalem, Israel.
(Professor A. Hassner, 12th ICHC Congress, PO Box 50006, Tel Aviv 61500, Israel.)

Chemical education

20–25 August. 10th International Conference on Chemical Education. Waterloo, Canada.
(Prof. C. Chieh, Secretary General of 10th ICCE, Chemistry Department, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1.)

Novel aromatic compounds

20–25 August. 6th International Symposium on Novel Aromatic Compounds. Tonaka, Osaka, Japan.
(Prof. Hiizu Iwamura, General Secretary of ISNA-6, Department of Chemistry, Faculty of Science, The University of Tokyo, Bunkyo-ku, Tokyo 113, Japan.)

Calorimetry and chemical thermodynamics

25–28 August. International Conference on Calorimetry and Chemical Thermodynamics. Beijing, China.
(Mr Yu Zhi-wu, Department of Chemistry, Tsinghua University, Beijing, China.)

Mössbauer effect

4–8 September. International Conference on the Applications

IUPAC withdraws sponsorship of ICHAC-2

When the IUPAC Executive Committee met in Lisbon, Portugal, in April, it reviewed sponsorship of the 2nd International Conference on Heteroatom Chemistry (ICHAC-2) to be held in Albany, New York, USA, 17–22 July 1989.

The committee noted that IUPAC granted sponsorship specifically on condition that the plenary and selected invited lectures should provisionally be made available for publication by IUPAC. However, without prior consultation with IUPAC the conference organizers decided to accept an offer from VCH Publishers to issue the conference lectures as a book.

In view of this unilateral action, the Executive Committee decided unanimously to withdraw sponsorship by the Union of this conference and not to consider further meetings in the series.

of the Mössbauer Effect. Budapest, Hungary.
(Dr D. L. Nagy, ICAME '89, Central Research Institute for Physics; H-1525 Budapest, PO Box 49, Hungary.)

Plasma chemistry

4–8 September. 9th International Symposium on Plasma Chemistry. Pugnochiuso, Italy.
(Secretariat, ISPC-9, Centro Internazionale Congressi, Via Pio XII, 18, 70124 BARI, Italy.)

Vapor-liquid equilibria

6–8 September. 5th International Workshop on Vapour-Liquid Equilibria in 1-Alkanol + n-Alkane Mixtures. Trieste, Italy.
(CODATA/IUPAC Conferences, Prof. P. Alessi, Instituto di Chimica Applicata e Industriale, Università di Trieste, via Valerio 2, 34127 Trieste, Italy.)

Thin solid and liquid films

11–13 September. International Symposium on Thin Solid and Liquid Films. Bristol, UK.
(SCI Conference Secretariat: Mrs A. Potter (Conference Manager), Society of Chemical Industry, 14/15 Belgrave Square, London SW1X 8PS, UK.)

Electrochemistry

17–22 September. 40th International Society of Electrochemistry Meeting. Kyoto, Japan.
(Prof. Yasuhiko Ito, Secretary General, The 40th ISE Meeting, c/o Kyoto International Conference Hall, Takaraga-ike, Sakyo-ku, Kyoto 606, Japan.)

Flame structure

18–22 September. 3rd International Seminar on Flame Structure (ISFS-89). Alma-Ata, USSR.
(Organizing Committee, Seminar on Flame Structure, Institutskaya Street 3, Novosibirsk 630090, USSR.)

Nitroxide radicals

18–22 September. International Conference on Nitroxide Radicals (ICNR-89). Novosibirsk, USSR.
(Dr V. V. Martin, Secretary of ICNR-89, Institute of Organic Chemistry, Siberian Division of the Academy of Sciences of the USSR, Novosibirsk-630090, USSR.)

Organometallic chemistry

1–6 October. 5th International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS V). Florence, Italy.
("OMCOS-V", Dipartimento di Chimica Organica, University of Florence, Via G. Capponi, 9-50121 Florence, Italy.)

1990

Natural products

4–9 February. 17th International Symposium on the Chemistry of Natural Products. New Delhi, India.
(Dr A. V. Rama Rao, Secretary, 17th IUPAC International Symposium on the Chemistry of Natural Products, Regional Research Laboratory, Hyderabad 500 007, India.)

Biological and environmental reference materials

5–8 February. 4th International Symposium on Biological and Environmental Reference Materials (BERM-4). Orlando, Florida, USA.
(Dr Wayne R. Wolf, Nutrient Composition Laboratory, Beltsville Human Nutrition Research Center, Agricultural Research Service, US Department of Agriculture, Beltsville, MD 20705, USA.)

Porous solids

6–9 May. 2nd International Symposium on Characterization of Porous Solids (COPS-2). Alicante, Spain.
(Prof. F. Rodríguez-Reinoso, Departamento de Química Inorgànica e Ingeniería Química, Facultad de Ciencias, Universidad de Alicante, Apartado 99, Alicante, Spain.)

Carotenoids

20–25 May. 9th International Symposium on Carotenoids. Kyoto, Japan.
(Prof. Masayoshi Ito, Kobe Women's College of Pharmacy, 4-19-1, Motoyamakita-Machi, Higashinada-ku, Kobe 658, Japan.)

Trace elements in health and disease

5–8 June. International Symposium on Trace Elements in Health and Disease. Helsinki, Finland.
(Trace Elements in Health and Disease, A joint NTES–COMTOX Meeting, Symposium Secretariat, Institute of Occupational Health, Topeliuksenkatu 41 a A, SF-00250 Helsinki, Finland.)

Ceramics

24–28 June 7th World Ceramic Congress. Rimini, Italy.
(7th CIMTEC, Satellite Symposium 1, PO Box 174, 48018 Faenza, Italy.)

Macromolecules

8–13 July. 33rd International Symposium on Macromolecules. Montreal, Canada.
(Prof. R. E. Prud'homme, Department of Chemistry, Laval University, Sainte-Foy, Québec, Canada G1K 7P4.)

Mechanisms of polymer strength and toughness

16–19 July. 13th Discussion Conference on Macromolecules

Mechanisms of Polymer Strength and Toughness. Prague, Czechoslovakia.
(Dr P. Cefelín, Deputy Director, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovskèho n. 2, 162 06 Prague 6-Petriny, Czechoslovakia.)

Polymer analysis and characterization

23–25 July. 3rd International Symposium on Polymer Analysis and Characterization. Brno, Czechoslovakia.
(Dr Howard G. Barth, Du Pont Company, Experimental Station, Wilmington, Delaware 19898, USA.)

Organic synthesis

23–27 July. 8th International Conference on Organic Synthesis. Helsinki, Finland.
(Prof. T. A. Hase, c/o Travel Experts Limited, PO Box 722, SF-00101 Helsinki, Finland.)

Pesticide chemistry

5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, Federal Republic of Germany. (Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Physical organic chemistry

6–10 August. 10th International Conference on Physical Organic Chemistry. Haifa, Israel.
(Prof. Yitzhak Apeloig, Department of Chemistry, Technion-Israel Institute of Technology, Haifa, 32000, Israel.)

Raman spectroscopy

13–17 August. 12th International Conference on Raman Spectroscopy. Columbia, South Carolina, USA.
(Prof. J. R. Durig, Department of Chemistry, University of South Carolina, Columbia, South Carolina 29208, USA.)

Coordination chemistry

13–18 August. 28th International Conference on Coordination Chemistry. Gera, GDR.
(Dr D. Walther, Sektion Chemie der, Friedrich-Schiller — Universität. Steiger 3, Haus 111, Jena 6900, German Democratic Republic.)

Chemical thermodynamics

27–31 August. 11th IUPAC Conference on Chemical Thermodynamics. Como, Italy.
(Prof. Sergio Carrà, Dip. to di Chimica Fisica Applicata, Politecnico di Milano, Via Golgi, 39, 20133 Milano MI, Italy.)

Polymerization reactions

9–13 September. International Symposium on Mechanisms and Kinetics of Polymerization Reactions: Their Use in Polymer Synthesis. Paris, France.
(Professor E. Marèchal, Laboratoire de Synthése Macromolèculaire, 12 rue Cuvier, 75005 Paris, France.)

Safety in chemical production

10–13 September. 1st IUPAC Workshop on Safety in Chemical Production. Basel, Switzerland.
(This workshop is not open for general participation but restricted to a limited number of invited participants.)

Automation and new technology in the clinical laboratory

9–12 October. 4th International Congress on Automation and New Technology in the Clinical Laboratory. Barcelona, Spain.
(Dr Roman Galimany, Secciódе Automatizaci ón. Servicio de Bioquímica, Residencia Sanitaria Germans Trias i Pujol, Carretera Canyet s/n. 08916 Barcelona, Spain.)

Speciality polymers

7–9 November. International Symposium on Speciality Polymers. Singapore.
(International Symposium on Specialty Polymers, c/o Department of Chemistry, National University of Singapore, 10 Kent Ridge Crescent, Singapore 0511.)

1991

Polymer materials

10–15 February. Polymer 91: International Symposium on Polymer Materials: Preparation, Characterization and Properties. Melbourne, Australia.
(Prof. J. H. O'Donnell, Department of Chemistry, University of Queensland, Brisbane 4067, Queensland, Australia.)

Organometallic chemistry

25–29 August. 6th International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS). Utrecht, Netherlands.
(Prof. G. van Koten, Laboratory of Organic Chemistry, Department of Metal Mediated Synthesis, University of Utrecht, Padualaan 8, 3584 CH Utrecht, Netherlands.)

Analytical sciences

25–31 August. International Congress on Analytical Sciences. Chiba, Japan.
(Prof. Eiji Niki, The Japan Society for Analytical Chemistry, 1-26-2-304 Nishigotanda, Shinagawa, Tokyo 141, Japan.)

International Union of Pure and Applied Chemistry (IUPAC)

IUPAC

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 43 countries, each represented by a national organization, such as an academy of science or research council.

National Adhering Organizations

Academy of Scientific Research and Technology **(Arab Republic of Egypt)**
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Chemistry International

IUPAC

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Front cover: New Jersey Institute of Technology Air Pollution Laboratory — see page. 173. (*Photo courtesy Dan Katz.*)

1988 International Union of Pure and Applied Chemistry

Political participation of scientists

On 21 October 1988, Prof. John Polanyi, winner of the 1986 Nobel Prize for Chemistry, visited the Ottawa Valley community of Deep River, Canada and spoke on the "Responsibilities of the scientist". His lecture was the first W. B. Lewis Memorial Lecture in memory of the Canadian scientist Dr W. B. Lewis, who led the scientific and engineering teams in developing the CANDU power reactor.

Prof. John Polanyi.

Polanyi first considered the relationship between morals, which reflect declared beliefs in what is good, and ethics which describe a set of rules for translating morals into a code of behaviour. He wondered whether scientists and engineers should attempt to define a set of rules analogous to the Hippocratic oath espoused by the medical profession, rules which stipulate that no harm be done to a patient — no deadly drugs be administered — no potion be given to procure an abortion.

"frequently the scientist or physician must choose the lesser of two evils if any worthwhile action is to be taken."

In spite of 2000 years of experience, there remain very serious problems in defining the ethical relationship between physician and patient. Are there ever circumstances in which a doctor may violate these precepts and allow a terminally ill patient to die? Do the rules help the cancer specialist who notices that the man in front of him in the bus queue has a fatal melanoma on the back of his neck? Rules cannot always provide an appropriate answer and frequently the scientist or physician must choose the lesser of two evils if any worthwhile action is to be taken.

Obligations to their craft

Polanyi next considered the obligations of basic scientists and engineers towards their craft. While individual researchers may not have the impact of a medical counterpart, they should not forget that as a group they are capable of moving society in new directions. Thus their collective scientific ethic must not be taken lightly.

A researcher's first commitment is to the craft since if the profession is not healthy neither he nor it will have credibility in the community. The scientist must care about his or her profession and must be convinced of the worth of science. Also they should be apologetic, for arguably the unfolding of the atomic nucleus is an achievement equal to the building of cathedrals or the writing of symphonies.

With intense commitment must come a passion for the chase in seeking the truth as well as the intellectual capacity for dispassionate enquiry. Scientists must strive to prevent suppression of data which do not fit a favoured model and be prepared to withstand adverse and harsh criticism. Polanyi noted that new discoveries of note are frequently met with rejection rather than praise, while fear of ridicule by one's scientific peers or fear of persecution by evil political regimes can tempt even the most able scientist towards unethical behaviour.

More subtle manifestations are attempts to misrepresent the worth of fundamental scientific enquiry as relevant to such practical concerns as health or defense in order to improve the chance of continued funding. Basic scientists are continually pressured to seek solutions to problems which confront society and to exploit ideas, rather than to seek new ones. Making specious links to political or to commercial masters through careful packaging will only disillusion the sponsor when results fail to meet expectations. In the long run science itself can be damaged if society begins to accept the packaging as more important than the substance.

Duty to society

Polanyi stated that scientists have a duty to society — to warn it of impending dangers and to lead it to health and increased prosperity. In return society should not attempt to channel scientific discovery into what are perceived as beneficent directions.

Almost any discovery can be used in both good and evil applications. Scientists must ensure that research does not of itself cause direct danger to others such as

through irresponsible release of toxins or of radioactivity. Polanyi rejected the option of purposely slowing down or even stopping scientific investigation in the hope of preventing the use of knowledge for harmful purposes. Knowledge itself is not the danger. The messenger who brought us $E = mc^2$ is no more to be blamed than the one who formulated $F = ma$.

Solutions to society's ills cannot be achieved by proscribing scientific investigation, rather, it is necessary for society to use the power of the scientific method and to guard against adopting degrading practices capable of exterminating humans as so many insects. Recognizing this need had lead Polanyi and several of his colleagues to begin building a million dollar fund to promote studies of society and science. Hopefully this will encourage scientists to take sabbaticals to engage in debates on society's problems.

"scientists must participate more fully in the affairs of government and seek to improve the level of information available to those in charge of major decisions."

Polanyi argues that scientists could be accused of being too silent in debates within society. Perhaps scientists and engineers have sheltered too long behind feelings of being too poorly informed to make a meaningful comment or that our specialties do not qualify us to speak on the broader issues of public policy. This cannot continue — the world is too dangerous to allow scientific talent to pursue a monastic existence: scientists must participate more fully in the affairs of government and seek to improve the level of information available to those in charge of major decisions. Today, as in the past, people including scientists get the government they deserve!

Imaginative solutions needed

Today's leaders are moving slowly toward the realization that human survival is impossible without collective agreement. International constraints defined through some form of world-wide organization such as the United Nations and requiring some sacrifice of national sovereignty are necessary if we are to begin addressing the needs of the environment, the hungry and the poor.

Polanyi noted that long established modes of thought can be changed and that society must not be afraid to adopt them. Through science we have seen the perceived wisdom of one generation being stood on its head only to re-emerge, strengthened and more able to address the concerns of the next. We must not be afraid to adopt new ideas concerning the role of force in our societies, the need for conservation and the need for more equitable sharing of wealth.

In concluding, Polanyi stated that scientists must be available to espouse imaginative solutions to conditions which trouble our society and, as an optimist, he is encouraged with the trend that increasing numbers are prepared to do so.

IUPAC/Chemistry International *is grateful to The Chemical Institute of Canada (CIC) for permission to reproduce the above item which was written by J. H. Rolston, FCIC (Deep River, Ontario, Canada) under the title "Polanyi urges political participation" and published in the "Viewpoint" section of* Canadian Chemical News, *page 9, January 1989.*

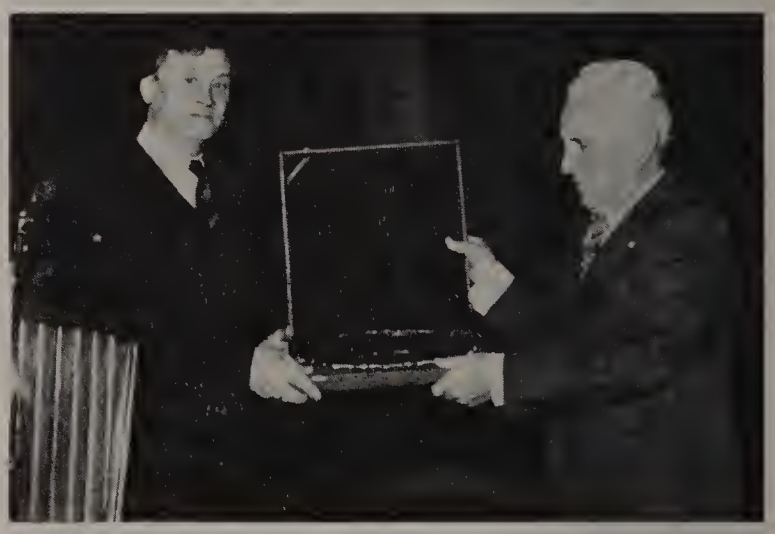
News & Views

Turkish Chemical Society celebrates 70th anniversary

The Turkish Chemical Society (TCS), which is the Turkish National Adhering Organization of IUPAC, celebrates its 70th anniversary this year. It was founded in 1919 by a group of chemists who graduated from the University of Instanbul.

At present TCS has about 2000 members. Membership of the society is open to those whose possess a Diploma in Chemistry. They are admitted by the Executive Committee on the recommendations of two other members. Other scientists, who have contributed to the aims of the society, may also be admitted as honorary members.

The society is governed by an annual general assembly of members and its administrative council. The council consists of nine members elected by secret ballot of active members every year. At the time of



On 24 November 1988 TCS President, Prof. A. R. Berkem (right) on behalf of Turkish chemists presented a shield to Dr W. Fritsche (Gesellschaft Deutscher Chemiker) in recognition of the contribution of German chemists to the foundation of chemical education in Turkey.

writing (May 1989) the current president of the administrative council (elected June 1988) is Prof. A. R. Berkem.

The society is financed by individual membership fees. There are no official state subventions.

TCS President Prof. A. R. Berkem.

Principal TCS activities

TCS activities are principally orientated towards the advancement of chemistry. The society publishes the monthly news bulletin *Aylik Haber Bülteni*. This Turkish language bulletin contains various general interest news items on professional and scientific matters relating to chemistry.

TCS also publishes *Kimya ve Sanayi* (Chemistry and Industry) in Turkish, English, French and German four times a year. This journal contains various general interest articles on professional, scientific and international matters relating to chemistry.

Since 1958, TCS has been the Turkish National Adhering Organization of IUPAC with three delegates to Council. It also has several representatives on various IUPAC commissions and committees.

In 1986 TCS started operating the IUPAC affiliate membership scheme with 58 members. Numbers increased to 98 in 1988 but this year have fallen to 36.

TCS is also a member of the Federation of European Chemical Societies (FECS) and the International Organization for Chemical Societies in Development (IOCD). The society has also collaborated with the Chemical Societies of Balkan Countries.

IUPAC Information Service

In 1988, the IUPAC Information Officer (Dr Michael Freemantle), dealt with 177 general enquiries about IUPAC compared with 205 enquiries in 1987. By the end of May this year, 56 general enquiries had landed on the Information Officer's desk. Most enquiries have been concerned with IUPAC publications, IUPAC-sponsored conferences and the IUPAC affiliate membership scheme.

At present a list of all currently available IUPAC publications is in preparation and it is hoped to publish this as a catalogue in the future. Leaflets with details of IUPAC books recently published by Blackwell Scientific Publications were distributed with the July issue of *Chemistry International (CI)*. Further copies are available upon request from the IUPAC Information Officer.

Enquiries about forthcoming IUPAC-sponsored conferences should be addressed directly to the conference organizers. Names and addresses of these are given in the Conference Calendar section at the back of each issue of *CI*.

If you require general information about IUPAC, its publications, its company associates scheme or its affiliate membership scheme please contact:

The Information Officer, IUPAC Secretariat, Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF, UK. Telephone. +44 (865) 747744. Fax: +44 (865) 747510. Telex: 83229 IUPAC G.

The anatomical metamorphosis of Prof. Tom West FRS

It is always gratifying to discover that I am not the only editor to unwittingly allow (sorry: to allow unwittingly) the occasional error to slip through on to the pages of a chemistry magazine.

On page 518 of the May issue of *Chemistry in Britain* under the heading "Personal news" we learn that IUPAC Secretary General "Prof. T. S. West, CChem, FRSC, *emeritus* professor of anatomy at University College London" has been elected as a Fellow of the Royal Society. In fact Tom West is *emeritus* professor of chemistry at Imperial College (and retired Director of the Macaulay Institute).

Numeric representation of dates and times

Today's date (at the time of writing) is 9th June 1989. This can also be written as June 9th, 1989. Whichever form is used there is unlikely to be any confusion.

However, numeric representations of this date may well cause confusion. Here are some examples:

9 6 1989
6 9 1989
09.06.1989
6/09 89
89.06.09
06–09–89

If this is confusing enough, imagine the various numeric representations of 9th June 2001. We could write 09 06 01 or 01.06.09, 06/09/01 or 2001–09–06 or any combination thereof. Now add to this the time (say 10.40 in the morning) and we are likely to be

totally bewildered: 01/06–09.10:40, for example.

With the increasing growth of international communication and all the different forms of information exchange which result there is an obvious need for standardization of numeric representations of dates and times.

For this reason the International Organization for Standardization (ISO) has developed a simple, logical and coherent form, namely International Standard ISO/8601. It advises numeric representation of dates and times on an internationally agreed basis — from larger to smaller elements:

year — month — day — hour

This system primarily avoids confusion, but also has the advantage of flexibility: you can express every element of time or only the ones you need. Furthermore, the system facilitates arithmetic calculation, particularly in computer uses. And it is possible to continue the larger to smaller order by adding digits to indicate hour-minute-second, based on the 24 hour timekeeping system.

Examples of representation

- How do you represent 10 March 1992?
  ISO Standard: **1992-03-10**
- How do you represent 18 May 1990, 22 hours, 25 minutes and 30 seconds?
  ISO Standard: **1990-05-18T22:25:30**
- Exchanges in international business, company meeting calendars and accounting often find it practical to identify a date by week and day numbers. (Monday has been found the most appropriate first day of the week.)
  How do you represent Friday 9 April 1999?
  ISO Standard: **1999-W14-5**

How to represent, in numeric form: calendar dates, ordinal dates, dates identified by week number, periods of time, combined date and time of the day, etc. — all answers to these questions are given in the International Standard ISO 8601.

ISO 8601, "Data elements and interchange formats — Information interchange — Representation of dates and times", 14 pages, Price CHF 37 — can be ordered from ISO Central Secretariat, Case postale 56, CH-1211 Genève 20, Switzerland.

New National Centre in Portugal

A National Centre for the distribution of IUPAC provisional recommendations has been established in Portugal. The following name and address should now be added to the list of centres published in *CI*, Vol. 11, No. 2, p. 67, 1989:

Portugal

Professor C. A. Nieto de Castro,
Sociedade Portuguesa de Química,
Avenida da República 37-4°,
P-1000 Lisboa,
Portugal.

Thirty years ago

Thirty years ago, the 17th IUPAC Congress took place in Munich, FRG — from 30 August to 6 September 1959.

The congress was devoted principally to inorganic chemistry and was divided into the following sections: compounds with metal bonds; hydride chemistry; chemistry of actinides and lanthanides; preparation of super purity metals; water-like solvents; homogenous and heterogeneous gas equilibria; semi-conductors

Prof. Jacques Bénard was one of the plenary lecturers at the 17th IUPAC Congress in 1959. Bénard was Inorganic Chemistry Division President from 1967 to 1969 and IUPAC President from 1971 to 1973.

and compounds of semi-metals; and ternary oxides and sulphides.

One of the lecturers in the section on hydride chemistry was Prof. H. C. Brown (Lafayette, USA) who is now an IUPAC affiliate and who won the Nobel Prize for Chemistry in 1979. His lecture was entitled "The reactions of alkali metal hydrides and borohydrides with Lewis acids of boron and aluminium."

The congress also included five symposia concerned with the following topics: natural pigments and their biogenesis; biogenesis and synthesis of biologically important oligopeptide; reactions at ultra-high pressure; disposal and utilization of biogenic and industrial wastes; and food additives and pesticide residues in food (toxicological and analytical problems).

It is interesting to note that 30 years ago two of the symposia at the congress were concerned with wastes and food additives/pesticide residues; respectively.

There were six plenary lectures at the congress:

- Bildungsmechanismus der Metall-Kohlenstoff-Bindung und einige Aspekte über die Reaktionsfähigkeit metallorganischer Verbindungen der Schwermetalle (O. A. Reutow, Moscow, USSR).
- Chemical behaviour and bonding of boron hydride derivatives (A. B. Burg, Los Angeles, USA).
- Comparative chemistry of the lanthanide and actinide elements (B. B. Cunningham, Berkeley, USA).
- Compounds of fluorocarbon radicals with metals and non-metals (H. J. Emeléus, Cambridge, UK).
- Ionenreaktionen in nichtwäßrigen Lösungen (V. Gutmann, Vienna, Austria).
- Recherches récentes sur l'oxydation et la sulfuration des metaux au voisinage des conditions d'équilibre (J. Bénard, Paris, France).

Bénard was IUPAC President (1971–73) and also President of the Inorganic Chemistry Division (1969–69). Emeléus and Gutmann were also presidents of this division from 1959 to 1963 and 1973 to 1975, respectively. Reutow was a member of the IUPAC Committee on Teaching of Chemistry.

At that time, lectures were presented and published in English, French or German. English became the one official language of the Union in 1963 — originally it had been French.

We regret to record the death of:

Prof. F. Parisi, Italy (2 February 1989) — Commission on Biotechnology (1961–85).

Letter to the Editor

Labelling of the Periodic Table

Sir,

I welcome very much the decision of the Commission on the Nomenclature of Inorganic Chemistry to keep open the question of the labelling of the Periodic Table until more general agreement on it has been reached.[1] Many chemists are unhappy with the 1–18 labelling scheme that the Commission has adopted for the 1989 edition of the Red Book, for reasons that I have discussed elsewhere.[2]

In putting this question before the international chemical community, I would urge the commission to include the labelling shown in Table 1. This is based on the form of Periodic Table shown in Table 2.[3] This form is intermediate between the short form and the long forms, and has the advantage that it brings out the transition and the inner-transition series of elements in the way that the long forms do while at the same time still showing the secondary connections between elements that the short form does.[4] It is particularly effective in expressing the fact that zinc, cadmium, and mercury are more closely related to magnesium than they are to the transition elements, and in resolving the competing claims of lanthanum

and lutetium to be placed under yttrium. It also preserves the connection between scandium and aluminium,

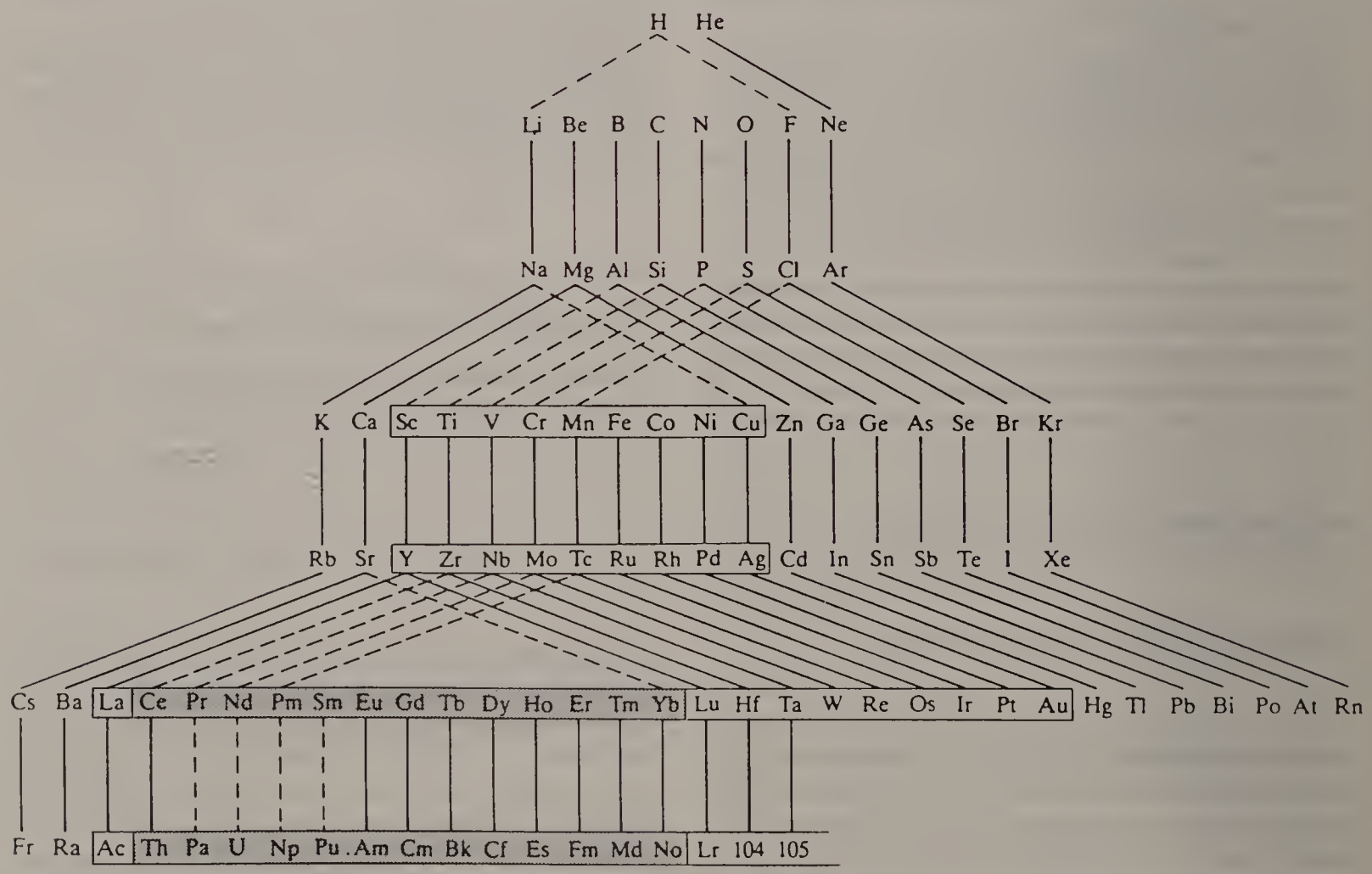
Group	*Label*
Lithium	1M
Beryllium	2M
Scandium	3T
Titanium	4T
Vanadium	5T
Chromium	6T
Manganese	7T
Iron	8T
Cobalt	9T
Nickel	10T
Copper	11T
Zinc	2M′
Boron	3M
Carbon	4M
Nitrogen	5M
Oxygen	6M
Fluorine	7M
Helium	8M

Table 1. Labels for groups in the Periodic Table.

which is lost in the long forms, by which Mendeleev predicted the existence and properties of the former element. Similar tables have been adopted by such distinguished scientists as Niels Bohr and Linus Pauling.

The labels shown in Table 1 are similar to those suggested by Sanderson.[5] Groups are numbered according to the maximum valency of the elements in the group and/or the number of valence-shell electrons. Main groups and transition groups are distinguished by the letters M and T. The two branches of main group 2 are distinguished with a prime. The corresponding designations for the lanthanides and actinides are shown in Table 3, where I stands for an inner-transition group.

I hope very much that the commission will include this scheme when seeking the views of chemists on the labelling of groups. I realize that the use of M, T, and I favours the English language, but it will be a sad day when science cannot employ descriptive labels, because they are tied to a particular tongue. Alternatives are to use α, β, and γ (A, B, and C, would create confusion with IUPAC 1970 usage of A and B) or N, N^*, N^{**} (N = group number),[6] but in my opinion the descriptive labels M, T, and I are much better. I am against the use of s, p, d, and f, because the resulting designations are not always correct.[2]


H He
Li Be B C N O F Ne
Na Mg Al Si P S Cl Ar
K Ca Sc Ti V Cr Mn Fe Co Ni Cu Zn Ga Ge As Se Br Kr
Rb Sr Y Zr Nb Mo Tc Ru Rh Pd Ag Cd In Sn Sb Te I Xe
Cs Ba La Ce Pr Nd Pm Sm Eu Gd Tb Dy Ho Er Tm Yb Lu Hf Ta W Re Os Ir Pt Au Hg Tl Pb Bi Po At Rn
Fr Ra Ac Th Pa U Np Pu Am Cm Bk Cf Es Fm Md No Lr 104 105

—— principal connections; – – – – secondary ones

Table 2. "Pyramidal" form of Periodic Table.

Group	*Label*
Lanthanum	3T
Cerium . . . Ytterbium	4I . . . 16I
Lutetium	3T'

Table 3. Labels for the lanthanides and actinides.

References

1. Busch, D. H., 1989. *Chemistry International*, **11**, 57.
2. Nelson, P. G., 1985. On the designation of groups in the Periodic Table (my title), *Chem. Br.*, **21**, 1078.
3. Adapted from Figure 1 of ref 4. I have corrected the printer's errors and changed the status of the connections between H and Li, H and F, and (giving more weight to electronic configuration and lower valencies) between Al and Sc. I have also boxed the transition elements (defined as elements in the long periods that form a transition between analogues of elements in the short periods) and shaded the inner-transition elements (defined similarly). I can supply a coloured version of the table to readers on request.
4. Nelson, P. G., 1987. On the best form of Periodic Table, *Educ. Chem.*, **24**, 171 (corrections: 1988, **25**, 3). See also Jensen, W. B., 1986. *Computers and Mathematics with Applications*, **12B**, 487.
5. Sanderson, R. T., 1964. *J. Chem. Educ.*, **41**, 187.
6. Sanderson, R. T., 1987. *Chem. Eng. News*, **65**, No. 24, 2.

Dr P. G. Nelson
The University, Hull
UK

Affiliate Affairs

In his Secretary General's Column in the November 1988 issue of *Chemistry International*, Prof. Tom West asked "Affiliate members, where are you?" and invited affiliates to pick up their pens and express their views on the Union and its activities. Since then a number of affiliates have written in with their comments. Three of these letters are published below together with the Secretary General's replies.

Task forces should be created

Thank you for your invitation to comment on my perspective of what IUPAC is doing in relation to restructuring and related issues. I was struck by the dichotomy outlined in your column about the acceptance by chemists serving within IUPAC of the rather ponderous, slow-moving pace of action while those outside may wonder what is taking so long, or, in fact, whether anything is happening.

That seems to me to be a major issue which should seriously concern both the Executive Committee and the Bureau. The establishment of the affiliate plan appeared to reflect new thinking on the part of IUPAC and the opening of new opportunities for an expanded group of chemists to serve the science and the profession on an international basis. I have not yet seen such expanded opportunities. I am worried that the recent decrease in the number of affiliate members may reflect this same concern on the part of others. Some affiliates may perform a cost/benefit analysis and decide that the benefits do not justify the cost.

Affiliate Daniel J. Watts is Deputy Executive Director of the Hazardous Substance Management Research Center, New Jersey Institute of Technology, USA. We are grateful to him for providing this issue's front cover photograph. It shows Clint Brockway of the NJIT Air Pollution Laboratory carrying out semi-preparative GLC separations of polycyclic aromatic hydrocarbons obtained from air-borne particulates.

I agree that a slow, deliberate approach is appropriate for issues such as nomenclature, symbols, and classification, yet for other issues which involve political and legal activities or fast-moving scientific developments such an approach could mean that the world will leave IUPAC behind. I believe that the creation of the "horizontal" interdisciplinary mission-orientated structure is an excellent idea. I would suggest an alternative to what I believe is the concept, however. The Secretary General should be empowered to create task forces or similar groups between formal Bureau or Executive Committee meetings, for the purpose of gathering information and formulating recommendations to deliberative bodies. The use of such groups could have two major benefits. Certainly the deliberative and decision-making process could be accelerated. To the extent that affiliates were appointed to these groups a wider participation of chemists in IUPAC affairs would be achieved.

I personally have an interest in increased IUPAC activity in the area of chemistry and the environment and chemistry and safety. Please let me know if I can be of any assistance to you or to IUPAC.

Daniel J. Watts
New Jersey Institute of Technology
USA

Secretary General's reply

We very much value these comments. There is indeed a basic dichotomy. It is precisely because of our awareness of the slow-moving nature of IUPAC's ongoing nomenclature and other types of work and the necessity of introducing a fast stream that the mission-orientated horizontal matrixing structure has been proposed by the President and so strongly supported by the Bureau. I believe with Dr Watts that we are doing the right thing.

As the person chiefly responsible for introducing the affiliate membership scheme (AMS), I very much appreciate Daniel Watts' concern that IUPAC should urgently pay attention to the affairs and concerns of its new constituents. When the AMS was launched in 1986 there were many in the Union who thought the idea would not succeed and possibly even some who hoped it might not (because, in time, it would change the "charmed circle" or exclusive club nature of IUPAC.)

I have been aware of the need for a better deal for affiliates within the Union. In 1987, in Boston, at the first general assembly of the Union following the introduction of AMS, I proposed, with the support of the Executive Committee and the Bureau, the formation of an Affiliate Affairs Committee to look into matters such as those referred to by Daniel Watts. But at that time, Council did not appear to favour the idea. So, rather than have it defeated, the motion was withdrawn. Possibly, it was too soon.

Perhaps, as I have indicated in this issue's Secretary General's Column, the corporate membership nature of the Union means that it takes a little longer than might otherwise be for the idea of the personal membership nature of AMS to win through. However, as indicated earlier in these pages, after three years of successful operation, I think that the time has now come to ask Council again to allow the matter to be examined. Incidentally, the membership in 1989 seems to be marginally on the increase again.

So Dr Watts, please bear with us a little longer. We certainly appreciate your concern and interest in this and other matters. Those of us who are at the heart of the Union's affairs share your hopes.

Lastly, many thanks for your constructive offer to help with some aspects of the Environmental Programme. We hope to get this put in place at the general assembly in Lund. Please let us know what particular aspects of environmental chemistry interest you most and where you feel you would most be able to help. We hope that many affiliates will indeed become involved in these new types of programmes. Volunteers are particularly welcome.

Chemistry, the environment and safety

As an affiliate member of IUPAC I would like to respond to your invitation to write to you as indicated in your informative column in the March 1989 issue of *Chemistry International*.

In my view, two of the most important matters proposed by Bureau are (1) chemistry and the environment, and (2) chemistry and safety. Obviously it would be in the interest of all for IUPAC to work closely with the World Health Organization (WHO) programmes.

However, my personal feeling over these issues is that, in the future, an integrated approach will be the way forward. For example, regulations in the UK require manufacturing industry to undertake risk assessments, largely for worker and workplace safety. This requirement has been reflected in the Royal Society of Chemistry's (RSC) *Indicative register for health and safety specialists*.

I do not consider that these go far enough as it would be comparatively cheap and simple to simultaneously retrieve and assess data on the environmental consequences of their products and indeed, where practicable, their waste products. Chemical waste should be viewed as a negative value commodity before it becomes someone else's liability.

I would therefore propose that IUPAC investigates the suggestion that regulators should have one integrated set of regulations and one body of inspectors who could inspect industrial premises and make assessments into both workplace and environment (air, land, water, waste etc.) risks. The concept of an officer from a water undertaking saying "you cannot

Industrial pollution: IUPAC officers made a special visit to the UNEP office and SCOPE headquarters in Paris this year to discuss how IUPAC might be involved with them in scientific matters relating to the environment (see page 128 of the July 1989 issue of *CI*). (*Photo courtesy WHO.*)

discharge that to drain" and not providing any further comment or advice is, in my mind, unacceptable.

The *Glossary of terms* which Dr Duffus and I are compiling for IUPAC will undoubtedly be of value, especially as these 1000 or so terms will cover both toxicology and ecotoxicology. The terms owe their origin to a large degree to the RSC's books *Toxic hazard assessment of chemistry*, 1986, reprinted 1988 and 1989, and *Risk assessment of chemicals in the environment*, 1988, and edited by myself.

Of the other items listed in your column, I do not see the value of the provision of a plastic-covered membership card.

As far as the role of *Pure and Applied Chemistry* is concerned. I would like to see the obligation to publish in *PAC* lifted and replaced with a first refusal option recommendation.

In general terms, I support the Bureau's other suggestions.

Mervyn L. Richardson
Rickansworth
UK

Secretary General's reply

In relation to pollution control, a single list of regulations and inspectors is a counsel of perfection that ideally we would all very much like to see in place. The problem is of enormous proportions, however, and is one that would dwarf IUPAC's entire present programme.

It is bodies such as the United Nations Environment Programme (UNEP) and the International Programme on Chemical Safety (IPCS) which have legislative links with government and national or civil regulatory authorities that can deal with such matters. IUPAC's links are with academic authorities such as the national academies of sciences and chemical societies rather than those others.

Obviously IUPAC could help them with scientific advice and input and indeed we are more than willing. As will be seen from this issue's Secretary General's Column (see page 182), three of our officers made a special visit to the UNEP office and SCOPE (Scientific Committee on Problems of the Environment) headquarters in Paris in February of this year precisely and solely to discuss how IUPAC might be involved with them in scientific matters relating to the environment.

Requests for the issue of plastic membership cards to IUPAC affiliates have arisen from several quarters. The Affiliate Affairs Secretary, Dr Freemantle did in fact cost this operation at my request several months ago. We think it would be a good idea but it would cost about USD 5000 per year and would have to be added to the affiliate membership dues. This we are reluctant to do and would prefer to keep the cost of membership at the lowest possible level. Such cards could, of course, be made available as an optional extra for those who wish, but in that case the costs might have to be considerably higher since each would have to be produced on an individual basis in the absence of equipment for their production at the IUPAC Secretariat. We wonder how many members might wish for such a facility?

The obligation for organizers of IUPAC-sponsored symposia to publish their plenary lectures in *Pure and Applied Chemistry* is in fact a "first refusal" one. When requests are made to us for good reason, we often agree to waive this condition.

IUPAC affiliates are active in Argentina

While reading the March 1989 issue of *Chemistry International*, particularly Prof. West's report of the Executive Committee meeting, I was compelled to write down some ideas about IUPAC and the activities of the affiliate membership scheme in Argentina.

First of all, I have one thing to tell Prof. West: **we are here in Argentina!**

When talking with some colleagues about IUPAC's activities and interests, I always receive the same answer: IUPAC only deals with chemical nomenclature, and it is very difficult to convince them that this is not the whole truth. They think of IUPAC as an abstract or sometimes "secret" organization that only publishes nomenclature rules.

As an affiliate I try to tell them the truth about IUPAC. I receive all the material scheduled by IUPAC and I use it to accomplish, or try to accomplish, the task. But there are a lot of problems that make this very difficult, especially to recruit new affiliates. The most obvious is our economic situation. A young chemist that joins our university as a laboratory assistant earns a rather low salary; many young chemists are employed by local industry.

In Argentina, like other developing countries, local industry does not support any kind of basic research and development. With certain exceptions, this results in a divorce between university and industry. This is why chemists working for industry are not interested in other activities. In recent years, our scientific system has lost a great number of young chemists who obtain jobs with better salaries in industry. This explains the decrease in affiliate numbers in Argentina from 43 in 1986 to 23 in 1988.

In the Argentine Chemical Association (AQA) we are working to reverse this situation. Amongst the activities which aim to establish a solid bridge between industry and the scientific research system are:

- Post-graduate courses given by scientists: there were 16 during 1988
- Seminars (10 in 1988)
- Conferences (9 in 1988)

All these activities were devoted to chemists working for industry. During the same period, two meetings were directly organized by AQA, one about computer science applied to chemistry and the second dealt with chemical information. Specialists from Latin America attended the first meeting whereas the second, co-sponsored by IUPAC, was attended not only by specialists from the region but also by Dr J. Seals (American Chemical Society), Dr S. Heller (IUPAC Committee on Chemical Databases) and Dr J. Rose (UNESCO) all of whom lectured.

An international meeting on chemical education,

Regional seminar in Argentina

In November 1988, Dr Stephen Heller presented a lecture on 'PC software and databases' for the Seminario Regional de Centros de Informatión Química Tecnológica en America Latina. The seminar, which was co-sponsored by IUPAC, was held in Buenos Aires.

Heller is Secretary/Coordinator of the IUPAC Committee on Chemical Databases (CCDB) and a member of the *Chemistry International* Editorial Advisory Board. His visit to Argentina was partly funded by IUPAC's Seminars/Visiting Professorships Programe.

Stephen Heller (4th from right) demonstrates PC software and databases at the regional seminar in Buenos Aires.

Dr Jaime Mazar Barnett, Chairman of the Seminar Organizing Committee (right), introduces Stephen Heller.

organized by the National University of San Luis (Argentina), co-sponsored by IUPAC, AQA and other national and international institutions, was held last year. Prof. Maurice Chastrette, Chairman of IUPAC's Committee on Teaching of Chemistry attended the meeting (see page 126 of the July 1988 issue of *CI*). An article on this meeting is to be published in the *International Newsletter on Chemical Education*.

AQA has 15 national representatives on IUPAC's committees and subcommittees and Prof. A. J. Arvía has been an elected member of Bureau since 1983. All of them work hard, but it is nearly impossible for them to attend all meetings of IUPAC's committees or general assemblies because of our economic difficulties and Argentina's geographical location.

Prof. A. J. Arvía has been an elected member of Bureau since 1983.

AQA also promotes IUPAC activities through *Industria y Quimica*, our bimonthly journal where IUPAC news is regularly published. This journal is distributed free to all members of AQA — about 2500 chemists around the country.

I hope that I have convinced you through these lines that affiliates in Argentina **are here**, working for IUPAC.

Finally, congratulations to the *CI* cartoonist.

Eduardo J. Bottani
INIFTA
Universidad Nacional de La Plata
Argentina

Secretary General's reply

I am delighted by Eduardo Bottani's letter and thank him very much indeed for the news of the energy and enthusiasm he and his colleagues are putting into local activities for IUPAC and Argentine chemists.

As a matter of fact, Argentina was one of the first countries to take up the affiliate membership scheme and before then, AQA was very active in distributing news of IUPAC's activities through its news magazine, so I am very much aware that Argentina is a bright spot for IUPAC.

I am pleased to take this opportunity also to inform Dr Bottani that IUPAC is trying, with the help of the International Council of Scientific Unions (ICSU), to set up a UNESCO/IUPAC Latin American programme of seminars and visiting professorships. I hope to have received a positive outcome by the time I come to write the next Secretary General's Column. Many thanks for your letter Dr Bottani; your visibility is indeed very high.

Affiliate numbers increase this year

By the end of May this year, IUPAC affiliate numbers had increased by just over 3% compared with the total number of affiliates in 1988. This is an encouraging sign, especially since there was a 4.5% drop in numbers from 1987 to 1988.

The table shows the number of affiliates registered in 1988 compared with the number who registered in the first five months of this year. By 31 May 1989, 7785 chemists from 79 countries had enrolled as affiliates whereas at the end of 1988 the number was 7539 from 91 countries. The total number for 1989 should increase further to almost 8000 by the end of the year.

The increase over last year can be attributed to two factors: (1) a publicity leaflet promoting IUPAC and the affiliate membership scheme was made available to all chemical societies operating the scheme; (2) the IUPAC component of the affiliate subscription was not increased in 1989.

Of the 7785 affiliates registered this year, 57% are members of the American Chemical Society compared to 79% in 1986, 65% in 1987 and 62% last year. The successful implementation of the scheme in Belgium, Ecuador, Poland, Sierra Leone, Trinidad and Tobago, and Yugoslavia has been especially welcome and there have been notable increases in numbers in Austria, Cameroon, France and Spain.

The number of affiliates from Third World countries has increased slightly from 821 in 1988 to 833 this year. Of these 833 Third World affiliates, 609 are chemists under the age of 35 years who have been granted "free" (sponsored) membership as a result of funds made available by IUPAC.

The vast majority (99%) of all affiliate memberships are handled through IUPAC's national adhering organizations and the national chemical societies of other countries. The IUPAC Secretariat administers a relatively small number of affiliate memberships directly — 69 so far this year. These memberships fall into the category of "special cases" and apply particularly to chemists in Third World countries that do not have national chemical societies.

Affiliate Numbers 1988 and 1989

Country	1988	1989 (at 89.05.31)
Afghanistan	1	0
Algeria	3	2
Arab Republic of Egypt	28	28
Argentina	23	16
Australia	9	1
Austria	3	34
Bahrain	2	2
Bangladesh	25	25
Belgium	2	99
Bhutan	1	1
Bophutatswana	1	0
Botswana	2	2
Brazil	14	0
Bulgaria	15	15
Cameroon	27	50
Canada	55	40
Chile	35	38
China/Beijing	24	31
China/Taiwan	3	20
Colombia	32	41
Congo	0	1
Cuba	26	25
Cyprus	1	1
Czechoslovakia	235	233
Denmark	29	31
Ecuador	0	6
Ethiopia	28	33
FRG	38	39
Fiji Islands	1	1
Finland	11	16
France	68	255
Ghana	25	35
Guatemala	1	0
Guyana	1	0
Hungary	10	10
India	17	30
Indonesia	64	52
Ireland	14	12
Iraq	4	5
Israel	1	1
Italy	140	165
Jamaica	1	18
Japan	349	322
Jordan	28	4
Kenya	28	21
Kuwait	22	22
Lao PDR	3	1
Lebanon	2	0
Lesotho	1	0
Libya	2	1
Luxembourg	1	0
Malawi	25	25
Malaysia	31	20
Mexico	3	2
Morocco	5	4
Mozambique	18	21
Netherlands	40	48
New Zealand	18	25
Nigeria	3	2
Pakistan	1	1
Panama	35	0
Papua New Guinea	25	0
Peru	48	38
Philippines	25	25
Poland	1	118
Portugal	16	14
Qatar	1	1
Republic of Korea	22	23
Republic of South Africa	265	284
Rwanda	32	52
Saudi Arabia	2	2
Sierra Leone	0	16
Singapore	38	20
Somali	0	1
Spain	51	116
Sri Lanka	26	28
Sudan	2	2
Swaziland	1	0
Sweden	10	16
Switzerland	17	24
Tanzania	1	0
Thailand	43	0
Trinidad and Tobago	0	25
Tunisia	4	3
Turkey	98	36
Uganda	1	0
UK	338	385
Uruguay	15	0
USA	4653	4481
USSR	120	81
Venezuala	1	0
Yemen Arab Republic	24	36
Yugoslavia	3	21
Zaire	12	1
Zambia	2	0
Zimbabwe	7	3
Total no. of affiliates	7539	7785
Total no. of countries	91	79

Affiliates in Sierra Leone

"Woman of achievement" Dr Joan Amarteifio has helped to promote the role of African women in the scientific professions.

Sierra Leone in West Africa started operating the IUPAC affiliate membership scheme this year. National Affiliate Membership Secretary Dr Joan O. Amarteifio has submitted the names and addresses of 15 young chemists in the country to be registered as affiliates. These sponsored affiliates will enjoy free membership as a result of funds made available by IUPAC.

Amarteifio lives in Freetown and is a chemist working for the Sierra Leone government. Her work principally involves analysis of geochemical samples for gold, aluminium, iron, titanium and other metals. This is part of the Geological Survey of the Ministry of Mines. Before moving to Freetown, Amarteifio was a scientific officer with the Ghana Standards Board in Accra. She was previously a lecturer in organic chemistry at the University of Sierra Leone.

One of her main interests has been the role of African women in the scientific professions and in 1985 she was interviewed by Voice of America in their series "African Women of Achievement".

Working on water projects in Jordan

Affiliate Dr Isaac Shishani is concerned with monitoring the quality of dam water in Jordan.

IUPAC affiliate Dr Isaac Shishani is involved with several projects concerned with monitoring water quality in Jordan. These include monitoring the quality of King Talal Dam water, monitoring the quality of national drinking water and monitoring the treatment of sewage of Jordan.

Shishani is Acting Head of the Water Laboratory in the Department of Industrial Chemistry at the Royal Scientific Society, Amman, Jordan. He is also project manager of a new project concerned with monitoring PCBs in transformer oil and its impact on the environment.

Flemish Chemical Society implements affiliate membership scheme

Since 1 January 1989, the Royal Flemish Chemical Society (Vlaamse Chemische Vereniging) has been operating the IUPAC affiliate membership scheme. *For further information contact: Marjan Van den Broeck, Krijgslaan 281 S12, B-9000 GENT, Belgium. Tel: +32 (91) 225715 Ext. 2827.*

Affiliate membership in Thailand

Dr Pirawan Bhanthunmnavin.

In May this year, Dr Pirawan Bhanthumnavin, Vice-President of the Thai Chemical Society visited the IUPAC Secretariat in Oxford. Operation of the affiliate membership scheme in Thailand was amongst the topics discussed. In 1988 there were 43 Thai affiliates, 25 of whom were young chemists sponsored by IUPAC.

Dr Pirawan is Director, General Education Project Chulalongkorn University, Bangkok. Her visit to Oxford was part of a programme of visits arranged by the British Council during her stay in the UK.

Metabolic bone disease research

Mariá Cristina Garciá-Himmelstine.

Mexican affiliate Mariá Cristina Garciá-Himmelstine is a member of the teaching staff in the Department of Biochemistry at the National Polytechnic Institute in Mexico City.

She is currently spending two years at the Departments of Clinical Chemistry, King's Mill Hospital and Nottingham University, UK, doing the practical work for her PhD project on "Studies of the vitamin D/parthormone endocrine system in common types of metabolic bonde disease".

Her supervisor whilst in the UK is Dr Howard Worth who is a coopted member of the IUPAC Clinical Chemistry Division Committee and was Secretary of the Commission on Teaching of Clinical Chemistry until it disbanded at the end of 1988.

Transfermium elements

An inter-union working group on transfermium elements met in Berkeley, USA in June this year. This report highlights some of the discussions that led up to this meeting.

The first meeting of an *ad hoc* joint IUPAC/IUPAP working group took place at Nonant, Bayeux, France from 3 to 5 February 1988. IUPAP is the International Union of Pure and Applied Physics.

The group consists of two IUPAC members [Profs Norman Greenwood (UK) and Yves Jeannin (France)] and seven IUPAP members [D. H. Wilkinson (UK); R. C. Barber (Canada); A. Hrynkiewicz (Poland); M. Leford (France); M. Sakai (Japan); A. H. Wapstra (Netherlands); and I. Ulehla (Czechoslovakia)].

Prof. Norman Greenwood who, with IUPAC President Yves Jeannin, represents IUPAC on the joint IUPAC/IUPAP Transfermium Working Group. Greenwood was President of the Inorganic Chemistry Division from 1977 to 1981.

At the Nonant meeting, the Chairman, Prof. Sir Denys Wilkinson (University of Sussex) pointed out that the work of the group will divide naturally into two phases:

1. The establishment of criteria that must be satisfied for discovery of new chemical elements to be recognized;
2. The application of those criteria in practice.

As far as possible the criteria should be technology-independent so that new methods do not demand revision of the first phase.

Phases 1 and 2 cannot be fully separated from each other because criteria must be applicable if they are to be useful and so the feasibility of phase 2 must be borne in mind in the definition of phase 1.

Nevertheless, Wilkinson thought that work should proceed by these two phases, with agreement being secured on the first before putting the second into effect. This was to avoid any suggestion that criteria were being defined to suit specific cases to which they were going to be applied or that criteria were being avoided because specific cases were unable to satisfy them.

Names of elements

The group noted that, within its terms of reference, it was not in either of its phases concerned with the naming of new elements. The names of elements are finally decided upon by IUPAC, specifically as recommended by its Commission on Nomenclature of Inorganic Chemistry (CNIC).

The recommendation of a name by IUPAC is not a matter of priority of discovery, but, as stated in the

"Red Book", a matter of practicality and prevailing usage (so that the accepted name of an element might change from epoch to epoch depending on usage). It was pointed out that IUPAC never denied the right of a discoverer to give a name to a new element and that this would be endorsed by IUPAC should it be accepted by the international community as manifested through prevailing usage.

In this context the group noted that it would not be concerned with the names of elements with atomic number 104 or greater although it recognized that, in the second phase, questions of discovery would have to be addressed.

Discovery of new chemical elements

The group devoted some time to discussing the acceptability of evidence for the discovery of a new chemical element. It was of the opinion that evidence should preferably take the form of publication in a refereed journal but also recommended that any form of scientific publication that is freely available in the public domain on an unrestricted basis should be acceptable evidence. In particular, such publications should not be rigorously restricted to refereed journals. Non-refereed scientific publications including conference proceedings should also be acceptable.

Furthermore, the group provisionally concluded that pre-prints dated through the standard procedures of the institution concerned should be acceptable provided that they were intended for publication in the open literature (including openly published conference proceedings). However, the group recognized that it may not always be practical to publish the entirety of the evidence that lies behind, and might be necessary for the acceptance of, a claim.

The group considered that discovery of a new chemical element should be recognized only in respect of a direct and unequivocal claim for such made in the publication that presents the evidence or in a subsequent publication giving evidence supplementary to that of the earlier publication in which case the relevant date for the discovery would be that of the later publication.

The group was not concerned with priority of discovery. However, some of its considerations as to criteria for recognition of discovery would inevitably reflect upon that issue.

Concerning atomic number, the group thought it essential to establish the Z-value of the new element in order that its discovery be recognized.

The group also discussed at length whether or not to recommend a specific nuclear lifetime below which a new chemical element should not be regarded as having an existence in the sense of present concern (recognizing that this matter is strongly isotope-dependent). However, the group felt it best not to be too rigid in this matter noting that its criterion of time enough for the development of normal chemistry in principle might be thought to correspond to a lifetime of something like 10^{-15} to 10^{-14} seconds.

Darmstadt meeting

The Transfermium Working Group next met in Darmstadt, FRG, 12–16 December 1988. At this meeting, Greenwood pointed out that, originally, names for new elements were given by people who considered themselves to be their discoverers, and were accepted by common usage, there being no international body like IUPAC. Nowadays, CNIC very seriously considers names proposed of discoverers but is not obliged to accept them.

What are transfermium elements?

Transfermium elements are elements with atomic numbers 101 onwards. Seven of these elements are listed on page 847 of the June 1988 issue of *Pure and Applied Chemistry:*

Atomic number	*Name*	*Symbol*
101	Mendeleviuim	Md
102	Nobelium	No
103	Lawrencium	Lr
104	Unnilquadium	Unq
105	Unnilpentium	Unp
106	Unnilhexium	Unh
107	Unnilseptium	Uns

Names and symbols for elements with atomic numbers 104 to 107 are systematic and based on the atomic numbers of the elements as recommended by CNIC. The names are composed of the following roots representing digits of the atomic number:

1 un,	2 bi,	3 tri,	4 quad,	5 pent,
6 hex,	7 sept,	8 oct,	9 enn,	10 nil.

The ending "ium" is then added to these three roots. The three-letter symbols are derived from the first letters of the corresponding roots. For example, element 104 has three roots: un, nil, and quad. It thus has the name unnilquadium and the symbol Unq.

Names have been officially accepted by IUPAC for elements 101, 102 and 103 and quasi Greco–Roman names and corresponding three letter symbols have been suggested for all elements from 100 to 999 (see Box), with the intention that they shall be replaced by "normal" names as soon as their discovery is officially accepted.

The group was not happy that the date of an important discovery cannot always be accepted to be the date of reception by a refereed and generally accepted journal. Every other choice will lead to difficulties. Thus, it must be decided which type of conference proceedings is acceptable as regular evidence for the date of the discovery.

Concerning the "definiteness of claims", the statement that recognition of priority can be made "only in respect of a direct and unequivocal claim" was amended to mean that a certain Z-value must have been assigned to a newly produced nuclide, but no claim is required that this Z-value is demonstrated here for the first time.

Confirmation by a second laboratory before giving names is required by IUPAC rules. However, some group members remarked that laboratories may not be eager to undertake quite expensive work in order to confirm the priority of another laboratory.

The group noted that nowadays new elements are not discovered but rather produced in the same way that new chemical compounds are often produced rather than discovered. One group member mentioned that at some time the existence of an element 87 isotope was known from the observed occurrence of the element 85 granddaughter of an element 89 isotope. Yet, the element 87 was only accepted as discovered when properties of the relevant isotope were reported. A somewhat comparable precedent in an entirely different field was the discovery of the planet Pluto: it was predicted by calculation (just like Uranus) but the credit for discovery went mainly to the observer who saw it first.

Another important question was the matter of cross-section ratio of (particle, alpha xn) and (particle, xn) reactions. Claims for priority based on the discovery of an isotope of an element by observation of a daughter in a decay chain involving its alpha decay daughter cannot be accepted if the first type of reaction, which directly produces this daughter, is not shown to be unimportant.

The group met again at Berkeley, California, USA from 19 to 23 June 1989. Another meeting is planned to be held at Dubna, USSR. Berkeley, Darmstadt and Dubna were chosen as venues for these meetings since these were the locations of major laboratories involved in transfermium work.

At the Nonant meeting in 1988, the group drew up an initial list of laboratories for circulation of "open notes" (upon which this report is based). The group agreed that interested institutions could be kept informed (through receipt of the open notes) and that expressions of opinion and advice from them would be welcomed. *Institutions requiring copies of these open notes should contact: Dr A. H. Wapstra, NIKHEL — Sectie K, Postbus 41882, 1009 DB Amsterdam, Netherlands.*

Secretary General's Column

Prof. Tom West

Secretary General Prof. Tom West reports on the Executive Committee meeting held in Lisbon, Portugal in April. Restructuring of the Union, the environment, biotechnology and the affiliate membership scheme were amongst the topics discussed.

Restructuring

During the period 1987–89, the various sectors of the Union began to examine their procedures and programmes with a view to re-orientating their work in such a way that, in future, they may more easily be able to respond to the changing needs of chemistry and the community.

IUPAC's traditional divisional structure is good, but it makes it difficult for the Union to respond rapidly to new factors which cover a range of chemical disciplines. The Bureau has twice during this period engaged in full-time debate on restructuring, with input from the Executive Committee acting as a task force.

It has decided that, whilst most division activities (the so-called vertical structure of IUPAC) should continue, there must be instituted a new mission-orientated series of programmes (the so-called horizontal structure), involving several or all divisions in relation to topics such as chemistry and the environment, chemistry of advanced materials, chemistry and safety and so on.

Only in this way will IUPAC be able to adapt its operating mechanisms to deal with such essential topical problems, whilst still being able to discharge the essential tasks for which it was originally set up in 1919. At the same time, even here, the Union needs to examine some of its ongoing activities, for example on

Secretary General Prof. Tom West urges affiliates to exert pressure on their own chemical society to launch a recruitment drive for new affiliates and perhaps set up a national IUPAC affiliate group.

Dr Mary Good discusses restructuring of the Union with Prof. Norman Sheppard (left) and Prof. Yves Jeannin (right) at the Executive Committee meeting in Lisbon.

nomenclature where it is largely reactive rather than creative. There is, for instance, a need to evolve a new computer-compatible systematic nomenclature for chemical compounds in conjunction with computer specialists.

Some of these envisaged mission-orientated or horizontal programmes may be of short duration, but others may be ongoing. The Bureau recommended that the Union should move progressively to have three of these programmes in place at any one time. The first of these programmes, is to be "Chemistry and the environment".

Repeatedly, vice-presidential reviews have shown that too many commission programmes are perpetuated for long periods of time — more than 10 years in some instances — despite the continual review mechanism instituted by the Executive Committee, Bureau and Council. It has been suggested that, in future, no programme should be allowed to continue for more than 10 years and that, as part of restructuring, division should move away from appointing full commissions for all their activities. Instead, limited life-time working parties should be appointed to tasks, such as nomenclature.

Environmental matters

Several international scientific unions of the ICSU (International Council of Scientific Unions) family are engaged on environmental programmes and UN (United Nations) bodies are also active in this area. Whilst the latter are chiefly concerned with governmental and regulatory matters, such as the work of UNEP (United Nations Environmental Programme), and IUPAC is not organized to engage in such work, it can and should provide scientific input to UNEP activities.

To this end, the President, Vice-President, Secretary General and Executive Secretary held discussions with UNEP and SCOPE (ICSU's Scientific Committee on Problems of the Environment) officials in Paris earlier this year. Contact was made with the UNEP programme and our existing somewhat tenuous relations were established on a firmer basis.

The Union's Information Officer is presently undertaking the production of a publicity brochure detailing the Union's recent and current programmes that relate to environmental matters and the reports and books that we have published thereon. IUPAC will cement and establish close working relationships with both these bodies in future in order to increase the contribution made by chemistry and IUPAC on the world scene.

CHEMRAWN and COCI

Meanwhile, it should not be forgotten that IUPAC's CHEMRAWN (Chemical Research Applied to World Needs) Committee has already played, and is still playing, a key role in relation to some of the proposed mission-orientated themes. For example, its first conference, CHEMRAWN I, related to raw materials at the time of the world energy crisis; its most recent conference, CHEMRAWN VI (held in Tokyo, May 1987) was devoted to new materials at the time when the scientific community became aware of new advances in superconductivity.

The registration desk at CHEMRAWN VI on Advanced Materials in Tokyo, May 1987. CHEMRAWN is already playing a key role in relation to some of the proposed mission-orientated themes of the Union.

The CHEMRAWN activities have thus effectively foreshadowed the challenge that the Union is now taking up as a whole. It is of interest to note that the next CHEMRAWN conference (probably to be held in Baltimore, USA, 1991) will be on atmospheric chemistry, underlining the increasing concern in IUPAC as a whole with environmental matters.

Nor is COCI, IUPAC's Committee on Chemistry and Industry, slow to pick up the challenge. Its first conference (Basel, 1990) will be on safety in chemical production. COCI is now beginning to play an increasingly important role in engaging the interest of the chemical industry in IUPAC's activities. This development is both significant and welcome.

The biological dimension

The Applied Chemistry Division has reorientated and revitalized the programme of its Commission on Biotechnology. During the past two years the progress it started to make at the previous general assembly in Boston in 1987 has continued and programmes are now in place that are of concern not only to chemistry as a whole, but particularly to the needs of third world industry. During the past two years, IUPAC has also played a leading role in supporting scientifically and financially ICSU's new inter-union Scientific Committee on Biotechnology (COBIOTECH).

In addition, the Clinical Chemistry Division, which was formed from the previous Section on Clinical Chemistry in 1979, has made steady and significant progress in the area where IUPAC's chemical interests interface with those of health and the physical well-being of mankind.

In 1987, permission was given to set up a new Section on Medicinal Chemistry to form an interface between chemistry and the medical sciences. This has been done and in February of this year, the new section held its inaugural meeting. Thus, IUPAC has considerably increased and strengthened its interests and activities related to biology, medicine and health.

Vice-President Prof. Yves Jeannin (left) and Past-President Prof. "Ram" Rao ponder the biological dimension at the Lisbon meeting.

IUPAC and the world's chemists

Upto the end of 1985, it was not possible for chemists to become voluntarily associated with their international scientific union, IUPAC. In the words of Past-President Heini Zollinger (Switzerland), IUPAC was a charmed circle, an exclusive, self-elected club.

In 1986 all that changed with the introduction of the affiliate membership scheme (AMS), whereby chemists could, with the approval of their national adhering organization or its designated chemical society, affiliate members.

This unusual scheme in which IUPAC, a body with corporate members, permits personal membership, has been a considerable success. Despite increases in membership fees, the number of affiliates has risen again this year following a small drop after the rise in 1987. Before AMS was set up, there were only 1400 chemists and 45 countries associated with the union; now there are about 9200 chemists from 80 countries — many of them developing ones.

Chemistry International (CI), now circulating about 10000 copies, six times a year, to all affiliates, company associates, national representatives, national adhering organizations, observer countries and members of divisions, commissions and standing committees, has become the Union's chief means of disseminating information and keeping chemists world-wide aware of what their Union is doing and planning for the future.

"We are pleased to have comments from the increasing numbers of affiliates who are writing in."

Affiliates are invited to comment on programmes, reports and so on, and we are pleased to have comments from the increasing numbers who are writing in. Several affiliates have already been re-

cruited to commission membership as a result. "That will teach him", retorted a commission secretary to me concerning one such newly enlisted member. I am not sure who will be teaching who what in that particular instance, but certainly the commission concerned seemed to have gained a really enthusiastic and active new member.

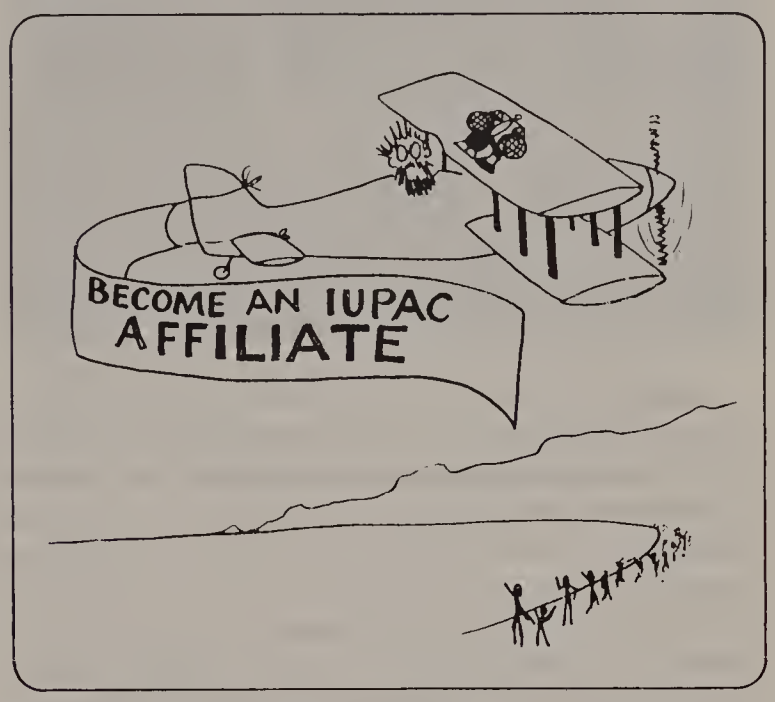
The Tower of Belém, rising off the Tagus river bank of Lisbon: the landmark for homecoming sailors long ago and one of the sights visited by the Executive Committee during a break in their meeting.

A comparative study of alternative distribution systems for information and publicity material for IUPAC has shown that, not only is *CI* a most attractive vehicle for such a task, but it is also by far the most cost-effective one available to the Union and interested chemists all over the world.

Since *CI* has clearly become such an effective information medium for IUPAC, and indeed a system that is much envied by other Unions, the Bureau has decided to recommend the budgetary investment of a modest sum in the production of *CI*. Furthermore, discussions have taken place with the Union's official publisher, Blackwell Scientific Publications, to stabilize the cost of the magazine for the next biennium. That is certainly good news.

But there are problems ahead. For example, The Secretary General's original target of 10 000 affiliates world-wide has not yet been attained and the Union has not granted many privileges to affiliates, other than encouraging its divisions and commissions to pay attention to their existence when looking for new members. Recently, the Union has decided to allow affiliates from non-member countries to be recruited to working parties though not to commissions or other statutory bodies.

Perhaps the time has come to consider AMS as a permanent feature, to enshrine its existence in the IUPAC statutes and bylaws, and to ask the Union's supreme body, the Council, to set up a task force similar to the original *ad hoc* founding Committee on Affiliate Membership (its name was actually "Committee on Maximization of Participations of Chemists in IUPAC Affairs" — a typical IUPACISM but, fortunately, COMPAC for short) to examine the Union's future relationship with its affiliates in view of the evolving situation.



National affiliate groups?

Bearing in mind the corporate membership nature of IUPAC, that is its members are national academies of sciences rather than individuals, it would be useful to hear from affiliates, titular and associate members of commissions, national representatives and working party members, what privileges they would like to see granted by the Union.

I do a lot of writing for the Union, so you will not, I hope dear reader, be surprised that I seek similar activity from you. Indeed, one thing the Union would very much appreciate from all readers is that they urge their own chemical society to launch a recruitment drive for new affiliate members. The Union cannot interact directly within national borders, but you, as a member of your chemical society, can exert some pressure. And, how about a national IUPAC affiliate group within your own chemical society? This would certainly enhance your position collectively as affiliates, to input to IUPAC and give added cohesion to your ideas and influence on the international chemical scene.

Communications from affiliates

Meanwhile, I am very pleased to see some letters beginning to come in from affiliates. Some of these were brought to the attention of the Executive Committee when it met in Lisbon and will probably also be seen by Bureau and certainly by any group or committee put together to consider the Union's relationship with what is now clearly its largest group of constituents.

IUPAC President Valentin Koptyug (left), Executive Committee member Prof. Shô Itô (centre) and Prof. Carlos Nieto de Castro, General Secretary of the host Socieda Portuguesa de Química cap their meeting with a joke during a brief visit to the hills at Sintra and its palaces, outside Lisbon.

Elsewhere in these pages (see pages 173–177) I have answered some of the points raised in these letters: more technical letters have been passed directly to the appropriate IUPAC body. I hope they will all be answered in due course. But, I hope writers of the original letters will appreciate that all of us who work on IUPAC bodies are volunteers, and do so in our sometimes rather spare time. So, it may take some time, particularly during the year of our biennial general assembly.

New members and Associated Organizations of IUPAC

We are very pleased to welcome Brazil back to full membership of the Union after a brief absence. In addition, two countries were seeking full membership for the first time at the 1989 general assembly, namely Ethiopia and Kuwait. Bangladesh has recently been granted Observer Country status.

Applications for Associated Organization status have been received from the International Organization for Chemical Sciences in Development (IOCD), the International Association of Colloid and Interface Scientists, the International Group for Correlation Analysis in Organic Chemistry, and the International Mechanochemical Association.

The increasing interest of countries and international organizations in becoming associated with IUPAC is, of course, a matter for considerable satisfaction and probably reflects to some extent our increased visibility in the world community of scientists through the affiliate membership scheme and the consequent widespread circulation of our news magazine *Chemistry International*. Nevertheless, we are presently in danger of losing one or two of our long-established member countries due to their national subscriptions being overdue at present. We hope that they may yet be able to avoid loss of membership.

Commission & Committee News

First Medicinal Chemistry Section meeting

The first meeting of the new IUPAC Section on Medicinal Chemistry was held from 16 to 17 February 1989 at the Centre de Neurochimie, Université Louis Pasteur, Strasbourg, France. Prof. Camille-Georges Wermuth (France) chaired the meeting.

The section discussed the establishment of a working party to tackle the facilitation of scientific collaboration between natural product laboratories in developing countries and the modern pharmaceutical industry. The working party will examine the feasibility of establishing a central repository of natural product extracts which would be maintained by the natural product laboratories and financed and accessed by individual companies in the pharmaceutical industry.

In addition, the section planned to ask a previously successful working party to continue their study of the standardization of the publication of computer graphics research.

The section also envisaged a number of collaborative efforts:

Members of the Medicinal Chemistry Section in Strasbourg: (from left) Prof. R. G. Glushkov (USSR); Dr A. V. Rama Rao (India); Prof. C. G. Wermuth (France, Chairman); Dr B. W. Metcalf (USA, Vice-Chairman); Dr N. Koga (Japan); Prof. H. Koenig (FRG); and Dr H. Kato (who assisted Dr Koga).

- exploration of common objectives with other international organizations such as the World Health Organization (WHO) and the International Union of Pharmacology (IUPHAR);
- cooperation with other medicinal chemistry bodies such as the European Federation of Medicinal Chemistry and various national medicinal chemistry societies. The initiation of an Asian Medicinal Chemistry Society would be encouraged;
- collaboration with the Committee on Teaching of Chemistry (CTC) to consider the training of medicinal chemists in modern approaches to drug design, in particular to recommend an "ideal" curriculum;
- collaboration with developing countries to increase the awareness of drugs in or approaching generic status which could be provided to patients in developing countries using research and manufacturing resources in these countries.

The section members also decided to sponsor the production of a monograph entitled *Future directions in medicinal chemistry*. The monograph would concentrate on the impact of molecular biology and computer sciences on medicinal chemistry.

Camille-Georges Wermuth

World Conference on the Environment

The CHEMRAWN (Chemical Research Applied to World Needs) Committee ended a two-day meeting in Montreal, Canada, 22–23 April 1989, by naming Walter Orr Roberts as general chairman for the CHEMRAWN VII conference on "**Chemistry of the atmosphere**". The meeting was held at McGill University under the chairmanship of John Thomas.

The committee reviewed the major issues relating to the organization of a world conference on such as sensitive topic. Over the past year, a subcommittee chaired by Bill Schneider (IUPAC President 1983–87) has prepared the ground for the preparation of this world conference which will probably take place in 1991 in the Philadelphia/Baltimore/Washington corridor of the USA. It is expected to attract approximately 1000 participants and have high-level US government involvement.

During the past year the committee enlisted Jack Calvert from the National Centre for Atmospheric Research (Colorado, USA) as programme chairman. Calvert is Chairman of the IUPAC Commission on Atmospheric Chemistry. CHEMRAWN VII General Chairman Walter Orr Roberts is President Emeritus of the University Corporation for Atmospheric Research (UCAR) in the USA. He was founder and first President and Chief Executive Officer of UCAR.

CHEMRAWN Committee meeting in Montreal. Seated: Prof. J. M. Thomas (Chairman). Standing (from left to right): Prof. E. J. Gryzwa; Dr A. Hayes; Prof. K. Saito; Dr W. Schneider; Dr R. H. Marchessault (Secretary) and Dr S. Varadarajan.

Two important topics were reviewed as possible future CHEMRAWN meetings:

- "**Waste as the raw material for chemical industry**". This is being coordinated by Prof. E. Grzywa. The conference would have a predominantly technical focus and will probably be under the leadership of Eastern European countries.
- A second world conference on "**Food production**" is being encouraged by Dr S. Varadarajan, whose presentation emphasized the slowing of the green revolution and the influence of factors such as harvest failures, drought, agricultural desertification and urban sprawn on world food shortage. A meeting in India in the next few years is under serious consideration.

The committee heard first hand from Prof. C. Ponnamperuma concerning activities of the Third World Academy of Sciences and he gave a brief review of the CHEMRAWN II follow-up workshops which had taken place in Argentina, Kenya and Sri Lanka. Another workshop is planned in Liberia.

Dr Robert Maybury of the International Organization for Chemical Sciences and Development (IOCD) gave an account of the objectives of his organization with respect to Third World scientists. Research on topics such as tropical disease, fertility and so on, are being supported through research money obtained from various world bodies. CHEMRAWN agreed to work with IOCD in furthering their objectives.

Bob Marchessault

PAC Review

Pure and Applied Chemistry (PAC) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Evolution of terpenes to sterols

The evolution of terpenes to sterols was the subject of a plenary lecture presented by Guy Ourisson (Strasbourg, France) at the 16th International Symposium on the Chemistry of Natural Products held in Kyoto, Japan, 29 May–3 June.

In his paper, Ourisson pointed out that molecular fossils of polyterpenoids are major constituents of the organic matter of sediments. They contain bacterial lipids, more or less modified structurally, not only from several classical families (steroids, carotenoids), but also from groups (hopanoids, bisphytanoids) which have *first* been isolated in sediments, and have *only later* been recognized as bacterial lipids or postulated as such (tricyclopolyprenoids, isoarborinol, novel archaebacterial tetraterpenoids).

The recognition in these terpenoids of common structural features (dimensions, rigidity, amphiphilicity) and of a common functional role (membrane reinforcement), proved both *in vivo* and *in vitro*, leads to the hypothesis of a phylogenetic derivation of the various groups, by progressive enrolment of new enzymatic systems.

Ourisson's paper, along with other plenary and invited lectures presented at the Kyoto symposium were published in the March 1989 issue of *PAC*.

Affiliate contributions at Kyoto

Guy Ourisson is an IUPAC affiliate and was also IUPAC Secretary General from 1975 to 1979. A number of other affiliates also made contributions to the Kyoto symposium which were published in the March issue of *PAC*.

Affiliate Fadila Derguini (New York, USA) was one of nine authors from Columbia and Syracuse Universities who contributed a paper on the "Theory of rhodopsin activation: probable charge redistribution of excited stated chromophore".

Guy Ourisson was one of several affiliate contributors to the 16th International Symposium on the Chemistry of Natural Products held in Kyoto, Japan, 29 May–3 June. Symposium lectures were published in the March 1989 issue of *PAC*.

Canadian affiliate John C. Vederas (University of Alberta) presented a paper on "Investigations of polypeptide biosynthesis: formation of peptide amides". Shawn E. Ramer and Hengmiao Cheng were co-authors of the paper.

A paper by USSR affiliate G. B. Elyakov and three other researchers at the Pacific Institute of Bioorganic Chemistry (Vladivostok) was entitled "Structure–function relationship of polypeptide toxins: modifying gating mechanism of sodium channel".

The Vladivostok paper describes how sea anemone toxins are systematically classified according to amino acid sequence, topography of hydrophobic regions and known pharmacological and immunochemical activities. On the basis of these properties the toxins can be divided into two groups. The authors discuss the significance of each property with respect to the structure–function relationship. They show that pharmacological activity of sea anenome toxins correlates with topography of hydrophobic regions.

New Zealand affiliate John W. Blunt (University of Canterbury) was co-author of a paper on "Biological activity in New Zealand marine organisms". The paper reports an investigation into the incidence and significance of antiviral and cytotoxic activity in a New Zealand collection of marine organisms. Several compounds with potent biological activities were isolated and characterized.

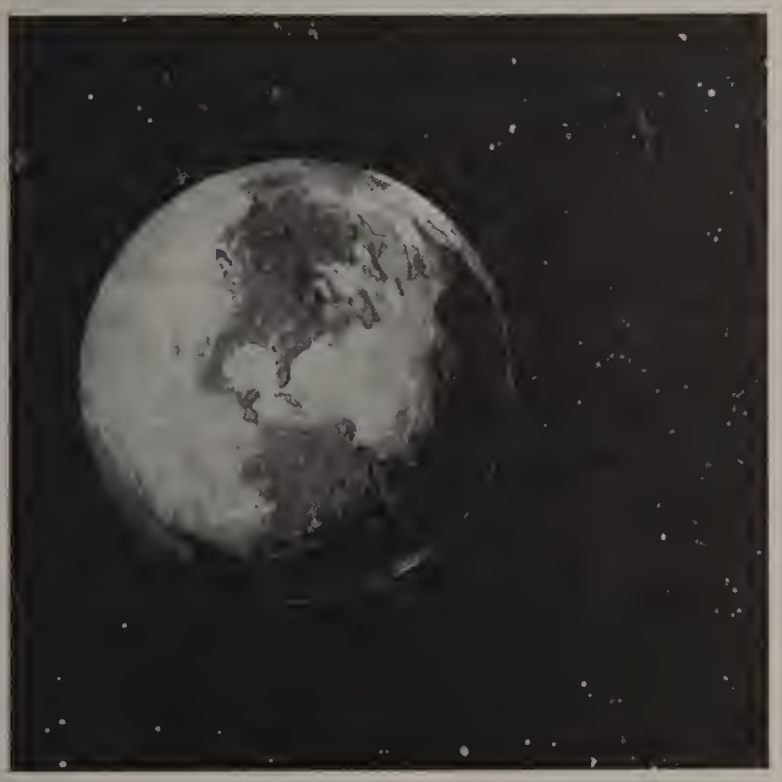
Three affiliates from Japan also contributed papers at the Kyoto symposium. Akio Murai (Hokkaido University) presented an invited lecture on "Total syn-

thesis of glycinoeclepin A". Yuji Naruse was one of four authors from Nagoya University who contributed a paper on a "New approach for natural product synthesis using main group organometallic reagents". Finally, Tetsuo Shiba (Osaka University) was one of several authors of a paper on "Synthesis and biological function of bacterial endotoxin".

IUPAC Organic Chemistry Division President Sukh Dev (India) presented a plenary lecture on "Guggultetrols: a new class of naturally occurring lipids". Sukh Dev described how a number of plants belonging to different families were screened for the presence of guggultetrols.

Interstellar organic chemistry

IUPAC affiliate Charles H. DePuy (University of Colorado, USA) presented a plenary lecture on "Interstellar organic chemistry and other applications of gas phase ion–molecule chemistry" at the 9th International Conference on Physical Organic Chemistry held in Regensburg, FRG, 21–26 August 1988.



At Regensburg, IUPAC affiliate Charles DePuy described some of the unique features of the gas-phase ion–molecule reactions which produce the 60 or so molecules and ions which have been detected in space. (*Photo courtesy NASA.*)

In the introduction to his lecture, DePuy said that the observation of complex organic molecules as major constituents in interstellar clouds has been among the most remarkable astronomical discoveries of the last few decades. At present, over 60 molecules and ions, mostly organic, have been detected in space, including the ubiquitous compound cyclopropenylidence, C_3H_2. The following is a representative sample of these interstellar molecules and ions:

CH^+	HCN	H_2CO	CH_3OH	$HCOOCH_3$
CO	H_2O	C_3H	CH_3CN	CH_3OCH_3
C_2	HCO^+	HCOOH	CH_3CHO	C_2H_5OH

$HC{\equiv}C{-}C{\equiv}C{-}C{\equiv}C{-}C{\equiv}C{-}C{\equiv}C{-}C{\equiv}N$

DePuy added that it is generally believed that the formation of these molecules involves gas-phase reactions between ions and neutral molecules.

The study of organic gas-phase ion–molecule chemistry, of which interstellar organic chemistry is just one example, has made remarkable progress in the last decade, with important implications for other branches of organic chemistry. Yet there are some important conceptual points about these reactions which often seem to prevent their incorporation into the general body of organic knowledge.

DePuy illustrated these unique features in his lecture and explained why, in spite of them, gas-phase ion reactions usually closely resemble those in solution. At the same time, he showed how the particular properties of gas-phase ion reactions make them especially suitable for the synthesis of organic molecules in the unusual environment of space.

Dynamic NMR spectroscopy

Another affiliate to present a plenary lecture at the Regensburg conference was Michinori Ōki (Okayama University, Japan). Ōki's lecture was entitled "Applications of dynamic NMR spectroscopy to the dissociation of chemical bonds in organic organometallic, and coordination compounds".

Ōki pointed out that dynamic NMR spectroscopy is useful in studying the rates of bond dissociation, if the molecule in question meets certain conditions. Examples quoted by Ōki included the dissociation of organic halides, ammonium salts, and coordination compounds involving amine (see Fig. 1), thioether, or olefin ligands.

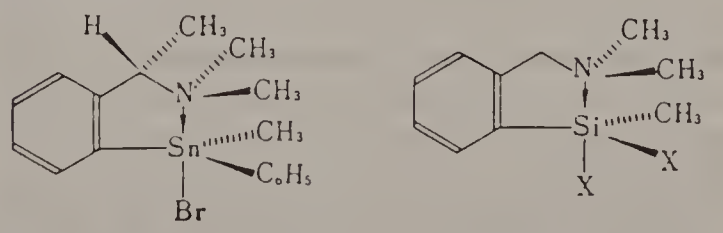


Figure In his plenary lecture at the Regensburg conference, affiliate Michinori Ōki presented examples of the application of dynamic NMR spectroscopy to the dissociation of chemical bonds in organic, organometallic and coordination compounds including these tin-amine and silicon-amine complexes.

The entropy of activation is characteristic depending upon the nature of the transition state: it has a large positive value if the ionic character is reduced but a large negative value if the ionic character is increased.

Plenary lectures presented at the 9th International Conference on Physical Organic Chemistry held in Regensburg, August 1988, were published in the April 1989 issue of *PAC*.

Recent Reports

In this section we publish summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports. The full texts of these recommendations and reports are published in *PAC*.

Determination of pH in highly saline waters

The problem of the measurement of the operational pH in natural and artificial highly saline waters (salinity greater than in ocean water) is discussed, and tentative recommendations by which reproducible and meaningful results can be obtained are presented.

This report was prepared for publication by Y. Marcus, Subcommittee on Environmental Analytical Chemistry, Analytical Chemistry Division, and published by PAC, *Vol. 61, No. 6, pp. 1133–1138, 1989.*

Sample digestion for the determination of elemental traces in matrices of environmental concern

This report summarizes various methods of sample digestion for (wet) chemical element analysis. The digestion method to be chosen for any practical problem depends largely on the element(s) to be determined their content(s) and the type of matrix. Addition of hydrofluoric acid is necessary in most cases as many organic (for example, plants) matrices contain silicon.

Where the completeness of the digestion is paramount, for example, in voltammetry, perchloric acid should be added, preferably when most of the organic matter is already oxidized. Perchloric acid is also recommended for matrices when $CaSO_4$ (which collects Pb) could result.

Pressurized digestions using strong oxidizing acids and hydrofluoric acid are recommended for many cases; they allow high temperatures during the procedure as well as prolonged durations and are free of contamination, provided that suitable equipment is used.

Microwave heating is also a very powerful technique.

Fusion techniques are very powerful in the analysis of ashes and certain rocks, but may be accompanied by high blanks and are time and labour consuming.

Two illustrations of the application of different techniques are given: incinerator ash (high with respect to trace elements, presence of highly resistant alumino-silicates) and milk powder (extremely low in trace elements).

Prior to the application of any digestion technique, its performance should be carefully studied, using certified reference materials, or in comparisons involving non-destructive techniques.

This report was prepared for publication by B. Griepink and G. Tölg, Commission on Microchemical Techniques and Trace Analysis (V.2), Analytical Chemistry Division, and published in PAC, *Vol. 61, No. 6, pp. 1139–1146, 1989.*

Analytical techniques for trace organic compounds-II. Detectors for gas chromatography

The principles of operation, characteristics, detection limits, and other important features are discussed for a number of gas chromatographic detectors with regard to their use in trace organic analysis. Other operating parameters which impact on trace organic analysis by GC are briefly discussed. Factors which are pertinent to selection of the proper detector for a particular analysis are pointed out. Some of the possible pitfalls of the detectors are discussed as well.

This report was prepared for publication by David G. Westmoreland and Gerald R. Rhodes, Working Group on Organic Trace Analysis, Commission on Microchemical Techniques and Trace Analysis (V.2), Analytical Chemistry Division, and published in PAC, *Vol. 61, No. 6, pp. 1147–1160, 1989.*

A proposal for the use of a standard formal for the publication of stability constant measurements

This proposal identifies the minimum information which should be presented in papers which report the results of measurements of the stability constants of metal complexes in solution. The required material relates to the experimental procedures, the computational or other methods used to calculate the constants, and the criteria of reliability.

The presentation of this information in tabular form is strongly favoured, in order to encourage the publication of short, informative, and critical papers. A sample table is included. Commission V.6 hopes that the editors of journals will encourage the use of this format in future.

This report was prepared for publication by Dennis G. Tuck, Commission on Equilibrium Data (V.6), Analytical Chemistry Division, and published in PAC, *Vol. 61, No. 6, pp. 1161–1163, 1989.*

Determination of 2-thiobarbituric acid value: direct method — Results of a collaborative study and the standardised method

The development, by collaborative study, of a standardized method for the direct determination of 2-thiobarbituric acid value in oils, fats and derivatives is described. Fats and oils are reacted, without previous isolation of volatiles, with 2-thiobarbituric acid, and the absorbency of red-coloured condensation products is measured at 530 nm.

This report was prepared for publication by J. Pokorny and A. Dieffenbacher, Commission on Oils, Fats and Derivatives (VI.3), Applied Chemistry Division, and published in PAC, *Vol. 61, No. 6, pp. 1165–1170, 1989.*

Melting temperatures of refractory oxides: Part II. Lanthanoid sesquioxides

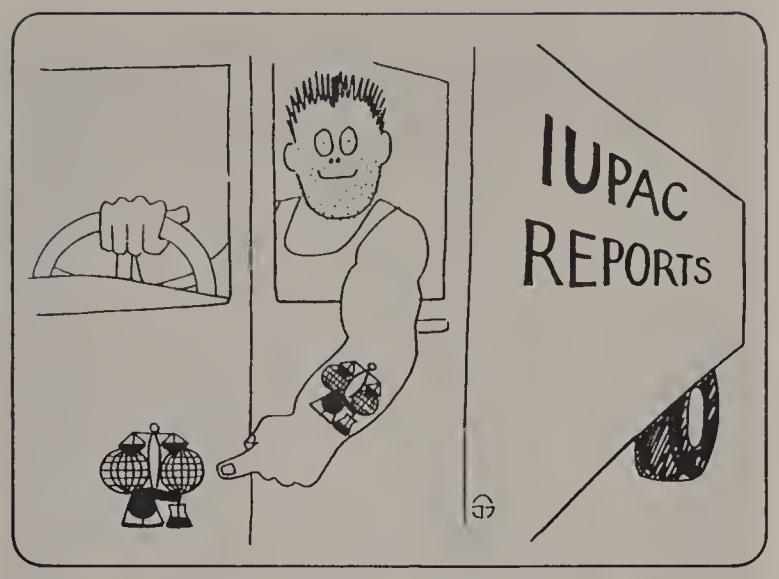
Experimental measurements of the melting points of the lanthanoid sesquioxides are critically reviewed and best values, with associated uncertainties, are recommended. Reasons for the quite large discrepancies, even in modern determinations, are discussed and studies to resolve the more important discrepancies are suggested.

This report was prepared for publication by J. P. Coutures and M. H. Rand, Commission on High Temperature and Solid State Chemistry (II.3), Inorganic Chemistry Division, and published in PAC, *Vol. 61, No. 8, pp. 1461–1482, 1989.*

Total and spontaneous fission half-lives for uranium, plutonium, americium and curium nuclides

Measurements of the half-lives of some long-lived nuclides of elements Z = 92, 94, 95 and 96 have been compiled and evaluated. Recommended values are presented for $^{232\text{-}236,238}$U, for $^{236\text{-}238\text{-}242,244}$Pu, for ^{241,242m,243}Am, and for $^{242\text{-}248,250}$Cm. Values are presented for both spontaneous fission half-life and total half-life. Problems with reported uncertainties are also discussed.

This report was prepared for publication by Norman E. Holden, Commission on Radiochemistry and Nuclear Techniques (V.7), Analytical Chemistry Division, and published in PAC, *Vol. 61, No. 8, pp. 1483–1504, 1989.*



Re-examination of 2200 m s^{-1} cross-section experiments for neutron capture and fission standards

The measurements of absolute standards for neutron induced capture reactions and neutron induced fission reactions at thermal neutron energies have been compiled and re-evaluated. These standards include capture reactions in ^{197}Au, and ^{59}Co, and fission reactions in ^{235}U and ^{239}Pu. The recommended thermal neutron cross-section values for these reactions are as follows:

$\sigma_\gamma(^{197}\text{Au})$ = 98.7 ± 0.1 barn;
$\sigma_\gamma(^{59}\text{Co})$ = 37.19 ± 0.08 barn
$\sigma_f(^{235}\text{U})$ = 586 ± 2 barn;
$\sigma_f(^{239}\text{Pu})$ = 752 ± 3 barn.

This report was prepared for publication by Norman E. Holden and Kristen A. Holden, Commission on Radiochemistry and Nuclear Techniques (V.7), Analytical Chemistry Division, and published in PAC, *Vol. 61, No. 8, pp. 1505–1510, 1989.*

Concentration units in water chemistry

For well-defined and identified organic and organometallic substances the contention of this paper is that a move towards amount concentration using units of mol l^{-1} would be timely and desirable.

For well-defined inorganic substances such as nitrate, phosphate, chloride, fluoride and so on, a move to amount concentration (mol l^{-1}) is also desirable.

For other inorganic substances with more complex aqueous chemistries the case is less clear cut. The analytical procedures used for these elements often involve extensive digestion to convert different chemical forms that may be present in the sample into a single form for analysis. This implies that different forms are often present of unknown and probably variable molecular weights. However, this feature is well known and widely recognized and it is not felt

Tony Dobbs (left) prepared the report on "Concentration units in water chemistry" for publication. In this photograph, taken at the Boston Science Museum during the 1987 IUPAC General Assembly, Dobbs is seen with Water Chemistry Commission Chairman Lars Gunnar (centre) and Commission Secretary Alan Tetlow (right).

that a move towards amount concentration in the presentation of results would prejudice this understanding, therefore such a move should not be discouraged for this reason.

The considerable problems involved in setting and monitoring compliance with composite standards covering groups of chemicals have been alluded to. In view of these and other difficulties single-compound standards are clearly preferable. However, if composite standards of analytical determinations are made, amount concentration is preferred to mass concentration and mol l^{-1} preferred to g l^{-1}.

Several routine water chemistry measurements are effectively operationally defined, for example, Biological Oxygen Demand (BOD) or alkalinity. The operational definition of a given measurement should not discourage the use of consistent units. If the determination, as in the case of BOD or alkalinity, involves the determination of the concentration of a single well-characterized substance, for example, oxygen of strong acid, amount concentration should be used. If the identity of the species involved is not well characterized, for example, humic acid, the use of mass concentration is unavoidable, its continued use serves to emphasize that the identity of the species has still to be established.

This report was prepared for publication by A. J. Dobbs, Commission on Water Chemistry (VI.6), Applied Chemistry Division, and published in PAC, *Vol. 61, No. 8, pp. 1511–1516, 1989.*

Publications

SCOPE 1989–1991

The Scientific Committee of the Environment (SCOPE) of the International Council of Scientific Unions (ICSU) is an international non-governmental, non-profit organization established in 1969. The objectives of SCOPE are:

- To advance knowledge of the influence of humans on their environment, as well as the effects of these environmental changes upon people, their health and their welfare — with particular attention to those influences and effects which are either global or shared by several nations.
- To serve as a non-governmental, interdisciplinary and international council of scientists and as a source of advice for the benefit of governments and intergovernmental and non-governmental bodies with respect to environmental problems.

The committee seeks to identify problems of global concern and intends to make a useful contribution to the understanding of such problems.

In choosing what it will and will not do, SCOPE has been governed by five basic criteria. Their application — not always consistent — has led to its concentrating on a few topics of special interest:

1. SCOPE emphasizes the stimulation of new approaches, synthesizing existing information, organizing balanced appraisals, and pointing out more important research needs. SCOPE does not engage directly in research at bench or field levels.
2. SCOPE deals with scientific problems that have major significance on the world environmental scene.
3. At the same time, SCOPE concentrates on problems which offer some promise of manageable action within anticipated constraints of personnel and funds, undertaking only what can be accomplished in a reasonable period of years.
4. SCOPE stresses those activities which are genuinely international, non-governmental, and interdisciplinary. National topics can be tackled at that

level; the ICSU and other scientific bodies are generally best fitted to handle analyses within a single discipline.

5. SCOPE thus avoids problems clearly within the range of existing organizations.

The SCOPE Secretariat is located with the ICSU Secretariat at 51, Boulevard de Montmorency, Paris.

The membership of SCOPE includes at present 35 adhering bodies and 20 ICSU international bodies adhering to SCOPE. A general assembly is held every three years.

SCOPE is a component of ICSU, an international non-governmental scientific organization. The membership of ICSU includes 67 national members and 20 international scientific unions, 26 scientific and seven national associates. Where there is a need for continuing collaboration amongst several unions, ICSU establishes collaboration amongst several unions, ICSU establishes interdisciplinary scientific committees, of which SCOPE is one.

SCOPE seeks to synthesize environmental information from diverse fields, identifying knowledge gaps and disseminating the results. The extent and quality of its concerns are reflected in its list of publications and particularly the SCOPE reports.

The main emphasis of SCOPE is currently on the following problem areas:

- Biogeochemical cycles
- Ecotoxicology
- Genetically designed organisms in the environment
- Subsiding coastal areas
- Global change
- Groundwater contamination
- Use of scientific information towards sustainable development.

SCOPE has recently published a booklet — from which the above account is taken. The booklet is entitled *SCOPE: Scientific Committee on Problems of the Environment 1989–1991*. Contents of the booklet are: 1. Aims and criteria; 2. Programme; 3. Organization of SCOPE projects; 4. Financial aspects; 5. Adhering bodies and SCOPE committee chairpersons and contacts; 6. ICSU international bodies adhering to SCOPE; Constitution of SCOPE and ICSU guidelines for organizers of international scientific meetings; publications.

For further information about SCOPE, its activities and its publications contact: SCOPE Secretariat, 51, bd de Montmorency, 75016 Paris, France. Tel: +33 (1) 45 25 04 90. Telex 630553 (F ICSU). Telefax: +33 (1) 42 88 94 31.

SCOPE seeks to synthesize environmental information from diverse fields, identifying knowledge gaps and disseminating results. (*WHO photo by A. S. Kochar.*)

Ecotoxicology and climate

Ecotoxicology and climate: with special reference to hot and cold climates (SCOPE Report 38, IPCS Joint Symposia 9) is based mainly on a workshop held at the Fraunhofer Institute for Environmental Chemistry and Ecotoxicology in Schmallenberg-Grafschaft, Federal Republic of Germany, from 1–5 July 1985. It was produced under the guidance of the Scientific Advisory Committee on Ecotoxicology, established by the Scientific Committee on Problems of the Environ-

Far less information (particularly quantified data) on the ecotoxicology of environmental chemicals is available from tropical, arid, subpolar and high mountain regions compared to temperate regions.

ment (SCOPE) in 1984 under the chairmanship of Philippe Bourdeau. Werner Klein and C. R. Krishna Murti were appointed co-chairmen for a project on "Ecotoxicology and climate with special reference to tropical, arid, and subpolar environments'.

The International Programme on Chemical Safety (IPCS), established in 1980 as a joint venture of the World Health Organization (WHO), the United Nations Environment Programme (UNEP), and the International Labour Organization (ILO), has among its objectives the evaluation of the risks to the environment of chemicals. It joined SCOPE in organizing this project, and John A. Haines of the IPCS Central Unit was appointed to the Scientific Advisory Committee for the project.

Considerable experience has become available on ecotoxicological principles of environmental chemicals, but mainly as a result of data from temperate regions. Far less information (particularly quantified data) is available from other regions, such as tropical, arid, subpolar, and high mountain regions. Different physical and chemical conditions as well as different interactions between chemicals and various physical and biological factors throughout the world could significantly influence effects of environmental chemicals. Furthermore, on the one hand, use patterns of chemicals may vary from those in temperate zones, and on the other hand many of the ecosystems found outside the temperate zones may be more vulnerable.

With the growing recognition that prevention of adverse effects of environmental chemicals is essential for health and sustainable development, as well as that chemicals used or generated in one region of the world may affect ecosystems in other regions, it was important to check the extent to which those ecotoxicological principles now being developed are universally applicable.

With a view to establishing a better scientific basis for the control of environmental chemicals in different parts of the world, the project has endeavoured to examine those ecotoxicological principles applicable to climatic conditions found in regions other than the temperate zones. Through the preparation of 21 papers and case studies by internationally recognized experts in their field, the project has examined the environmental fate and effects of chemicals. The project has concentrated on data available from the tropical, arid, subpolar, and high mountain regions on the fate of environmental chemicals and the response of ecosystems to chemical stress.

Most of the papers and case studies were available before the workshop, at which contributors and other invited participants reviewed the data and developed the report which forms the basis of this publication. This was edited by a small editorial group of the Scientific Advisory Committee who prepared the conclusions and recommendations.

This publication represents, according to the editors, the first systematic attempt to examine the applicability of ecotoxicological principles in non-temperate climatic zones. The report highlights areas where data are particularly lacking and recommends fields for further research and monitoring.

SCOPE Report 38, IPCS Joint Symposia 9: Ecotoxicology and climate *is edited by Philippe Bourdeau, John A. Haines, Werner Klein and C. R. Krishna Murti and published by John Wiley & Sons, Chichester, UK, 1989. xix + 392 pp. ISBN 0-741-91831-8. Price GBP 55.00/USD 113.85.*

SCOPE Past-President J. W. N. la Riviere wrote the forward to SCOPE Report 38. La Riviere is Professor of Environmental Microbiology at the International Institute for Hydraulic and Environmental Engineering, Delft, Netherlands.

Dithiocarbamate pesticides and their metabolites

Environmental Health Criteria, Report No. 78, entitled *Dithiocarbamate pesticides, ethylenethiourea, and propylenethiouruea: a general introduction* assesses what is known about the impact of dithiocarbamate pesticides and two of their most important metabolites on, man, animals, plants, and the environment.

Intended to serve as a general introduction to documented health and environmental risks, the report concentrates on those dithiocarbamates that are most used and best known in order to characterize these pesticides as a group. More than 250 published reports are critically assessed in terms of methodological design as well as findings.

The book has two main parts. The first concentrates on dithiocarbamates, summarizing what is known about their chemical and physical properties, modes of transport, distribution and biotransformation, and kinetics and metabolism in animals, plants, and microorganisms. A tabular presentation of consumption figures over time reflects the continuing large-scale use of these pesticides in agriculture, as well as in medicine, the rubber industry, and in the treatment of chronic alcoholism.

Recent titles in the WHO *Environmental Health Series*

64. Carbamate pesticides — a general introduction
65. Butanols — four isomers
66. Kelevan
67. Tetradifon
68. Hydrazine
69. Magnetic fields
70. Principles for the safety assessment of food additives and contaminants in food
71. Pentachlorophenol
72. Principles of studies on diseases of suspected chemical etiology and their prevention
73. Phosphine and selected metal phosphides
74. Diaminotoluenes
75. Toluene diisocyanates
76. Thiocarbamate pesticides — a general introduction
77. Man-made mineral fibres

Titles of Reports Nos 1–63 were listed on page 43 of the March 1988 issue of CI (*see also page 72 of the July 1988 issue of* CI).

The most extensive section reviews the results of experimental research and *in vitro* studies in an effort to determine effects on reproduction, embryotoxicity, teratogenicity, mutagenicity, and carcinogenicity. Mechanisms of toxicity and modes of action, including interaction with alcohol, are also considered. The concluding section of the first part, devoted to effects on man, summarizes findings from the few available studies of occupational exposures.

The second part presents similar information for ethylenethiourea and propylenethiourea, two of the most important metabolic products found in plants and in the environment following the agricultural use of certain dithiocarbamates. Since some methods of food processing are known to increase the levels of these metabolites, particular attention is given to studies measuring residue levels following the cooking of fresh vegetables, such as spinach, carrots, and potatoes, and after the canning of a number of fruits and vegetables.

Environmental Health Criteria No. 78: Diothiocarbamate pesticides, ethylenethiourea, and propylenethiourea: a general introduction *is published in English by the World Health Organization, Geneva, 1988, 140 pp. ISBN 92-4-154278-0. Price CHF 15.-/USD 12.00. Order no. 1160078.*

Cadmium

The concern about environmental toxins is ever increasing, as is the need for sound scientific information. The *Environmental Toxin Series* is dedicated to the publication of comprehensive reviews and monographs on compounds or classes of chemicals which are of importance in environmental toxicology.

The series is designed to serve as a background of information for scientific investigation as well as risk analysis and political decision making. The main aim of the series is to describe in as complete a way as possible all potentially hazardous chemicals from the point of view of chemistry, ecology, toxicology, risk analysis and regulatory implication.

Volume 2 of the series, entitled *Cadmium*, includes 18 out of 22 contributions to the 3rd IUPAC Cadmium Workshop held in Juelich, FRG, August 1985. The contents are divided into four sections:

1. Toxicity, carcinogenicity, animal experiments
2. Epidemiology
3. Cadmium in the environment
4. Methodology and quality assessment

Environmental Toxin Series *Vol. 2*, Cadmium, *edited by M. Stoeppler and M. Piscator is published by Springer-Verlag, Heidelberg, FRG, 1988. xii + 237 pp. ISBN 3-540-15551-1. Price DEM 148.*

Milk analysis: collaborative study procedure

The International Dairy Federation (IDF) has published the second edition of the IDF Provisional Standard:

"Milk and milk products: Precision characteristics of analytical methods — outline of collaborative study procedure".

For further information contact: E. Hopkin, Deputy Secretary General, General Secretariat, Square Vergote 41, B-1040 Bruxelles, Belgium.

Environmental data

Codata Bulletin Nos 70–71, December 1988 is Volume I of a report on "Directions for internationally compatible environmental data". The report, edited by Barry I. Diamondstone, was prepared by the organizing committee of a CODATA workshop held in Montreal, Canada in May 1986.

Volume I of this report contains integrated documentation of the workshop discussions and conclusions. The appendices include: sources for standard measurement methods, standard reference materials and references to directories of data resources; lists of major monitoring programmes and data banks; and a bibliography of references highlighted by workshop participants.

CODATA is the Committee on Data for Science and Technology of the International Council of Science Unions (ICSU). *The CODATA Secretariat is located at 51 Boulevard de Montmorency, 75016 Paris, France.*

Biotechnology proceedings

The 8th International Biotechnology Symposium was held in Paris, France 17–22 July 1988 (for a report, see pages 92–96 of the May 1989 issue of *CI*).

A two volume set of proceedings containing 129 symposium papers has recently been published. The papers are classified under the following main subject headings:

- Basic microbiology
- Genetics of animals cells
- Genetics of microorganisms
- Cell culture
- Protein design
- Enzyme and organelles
- Mass transfer and bioprocess kinetics
- Bioreactor technology and control
- Downstream processing
- Production of physiologically active molecules in heterologous systems
- Vaccines
- Biological reagents
- Recent progress in food and feed biotechnology
- Plant biotechnology and its impact on agriculture

Proceedings of the 8th International Biotechnology Symposium, Paris, July 17/22, 1988 *edited by G. Durand, L. Bobichon, J. Florent and Société Française de Microbiologies (2072 pp., published 1989) is available from Haigh & Hochland Ltd, International University Booksellers, Oxford Road, Manchester M13 9QA, UK. Price for the two volume set including postage and packing: GBP 80.00/USD 140.80/DEM 256.80/NLG 289.60/CHF 217.60.*

The 8th International Biotechnology Symposium was held at the Palais des Congrès (left) in July 1988. Prof. Manfred Ringpfeil (right), chairman of the Commission on Biotechnology and official IUPAC representative at the symposium, welcomed participants on behalf of the IUPAC president.

Guidelines for developing national drugs policies

WHO guidelines for the development of a national policy on the availability, quality, safety and efficacy of drugs and vaccines.

Guidelines for developing national drugs policies is a detailed guide to the development of a national policy aimed at ensuring the availability, quality, safety, and efficacy of drugs and vaccines. Addressed to policy-makers and administrators, the book identifies and explains the many complex factors that must be considered when planning and implementing a national drug policy. Particular emphasis is placed on information that can help readers understand practical issues and anticipate problems, whether at the policy level within the country or concerning international drug marketing and supply.

The book opens with a step-by-step explanation of the various components of a national drug policy, moving from the crucial need for a legal framework to consideration of costs, the selection and approval of products, procedures for drug procurement and distribution, and measures for quality control. Practical details range from advice on how marketing intelligence can strengthen a country's bargaining position with pharmaceutical manufacturers to examples of drug distribution involving different agencies of government and private enterprise.

Other chapters concentrate on specific issues that can influence the workability of a national drug policy, including legal issues, the impact of drug information and promotion on supply and use, actions that can support the appropriate use of drugs, and measures to promote safe and rational self-medication. Readers are also alerted to the importance of health education and given guidelines for monitoring the success of policy implementation, particularly concerning improvements in drug quality and safety. The book concludes with brief information on the establishment of financial priorities, the importance of research and development, and opportunities for technical cooperation between countries.

Guidelines for developing national drug policies *is published by WHO, Geneva, Switzerland, 1988. pp. 52. ISBN 92 4 154230 6. Price: CHF 11-/USD 8.80. French and Spanish editions are in preparation.*

The world drug situation

The world drug situation provides a comprehensive review of the many complex factors that influence the current availability and consumption of pharmaceuticals throughout the world. The report, which draws upon data and statistics available for well over 100 industrialized and developing countries, emphasizes factors that can help gauge the extent to which drugs are performing an effective role in society and in health care. Conditions and trends in both the public and private sectors, at national and global levels, governing undermedication or overmedication, are identified and discussed in this unique survey of the world drug situation.

The book has two main parts. Chapters in the first part analyse global trends in the consumption, production, trade, and sales of pharmaceuticals. Information ranges from data on the leading manufacturers and products, through statistics on changing per capita drug consumption by country and by region, to a discussion of the structure and dynamics of the pharmaceutical industry. Apart from documenting current trends, these chapters also identify a number of factors, such as the growth of generic producers and increasing complexity of research and development, that are likely to influence future trends.

The second part of the book profiles the drug situation in individual countries. Using a set of 10 indicators, chapters provide a systematic assessment of national drug policies, essential drugs programmes, conditions of availability and consumption, and the extent of local production for 104 developing countries, grouped according to three different levels of coverage.

Where appropriate, detailed discussions of the situation in individual countries are used to illustrate significant trends and identify problems faced by countries in specific situations. The book concludes with an overview of the drug situation in industrialized countries, including examples of different measures introduced to control costs, improve the prescribing practices of medical personnel, and promote more rational drug use by the public.

The world drug situation *is published by WHO, Geneva, Switzerland, 1988. pp vi + 123. ISBN 92 4 156114 9. Price CHF 20-/USD 16.00. A French edition is in preparation*

The use of essential drugs

General view of the WHO headquarters building in Geneva. WHO launched and promoted the concept of essential drugs in an effort to bring greater equity and rationality to this component of primary health care. Developing countries often had colossal drug bills — thousands of different preparations were typically available in a big city pharmacy, many of them imported from abroad with precious foreign exchange — yet great sections of the population had little or no access to modern medicines when they fell sick. At the same time, some of the available drugs were useless while others, though individually useful, were marketed in medically irrational "cocktails". (*Photo by J. Germain.*)

The use of essential drugs — model list of essential drugs is the 3rd report of the WHO Expert Committee and No. 770 in the WHO Technical Report Series. The report presents and explains the fifth WHO model list of essential drugs, incorporating revisions agreed upon by a 19-member committee of experts. The report also provides updated information on several other components of national drug policy necessary to assure that essential drugs, corresponding to priority health needs, are available at all times in adequate amounts and in the proper dosage forms.

The report opens with an explanation of the concept of essential drugs, emphasizing the advantages, in terms of economy and effectiveness, realized when countries use essential drugs lists, adapted to the local situation, to rationalize drug procurement and supply. Other sections outline steps that can help ensure that an essential drugs programme is adequately instituted at the national level, discuss criteria for the selection of essential drugs and pharmaceutical dosage forms, and outline different applications of the concept based on experiences gained in a large number of countries.

Readers are also given guidance in the selection of drugs for primary health care, in questions of quality assurance and in the use of drug utilization surveys to quantify a drug inventory or to evaluate patterns of drug utilization. Background information concludes with an outline of areas where research and development can hasten the self-reliance of countries, followed by a detailed discussion of the types of information and education necessary to ensure satisfactory therapeutic standards and rational prescribing.

The fifth WHO model list of essential drugs is then presented, together with an explanation of changes made when revising the list. Organized according to therapeutic group, the list includes information on route of administration, dosage forms, and strengths for each of 277 drugs included in the main list and in a complementary list.

The complementary list includes drugs for use when drugs in the main list cannot be made available or are known to be ineffective or inappropriate for a given individual, are needed for the treatment of rare disorders or in exceptional circumstances, or should be considered for use only when appropriate facilities for drug surveilllance are available.

In view of the large number of countries that have adopted an essential drugs programme, the publication of this report should be welcomed as a source of validated information and sound advice that can help extend the benefits of modern drugs to the world's population.

The use of essential drugs — model list of essential drugs (Technical Report Series, No. 770) *is published by WHO, Geneva, Switzerland, 1988. pp. 63. ISBN 92 4 120770 1. Price CHF 8-/USD 6.40. French and Spanish editions are in preparation.*

Four decades of achievement

A bigger killer than cholera

Cholera has long been one of the most feared of diseases. Endemic in Asia, it has periodically swelled to epidemic proportions there and then spilled out into other corners of the globe, provoking panic and despair.

A typical Third World shanty town mushrooming up on the fringe of a spreading city. Houses are makeshift and shelters built from any material that comes to hand. Apart from discomfort and squalor, there is an ever-present threat to health where water supplies and sewerage facilities are lacking.

It took the efforts of the World Health Organization to alert the word to the fact that cholera, a diarrhoeal disease, was by no means the biggest such killer. In the poorer countries, four to five million children a year were falling victim not to cholera but to other diarrhoeal diseases that they were expected to catch as a matter of course.

The root causes of these common diseases — dirty drinking-water, contaminated food, inadequate personal hygiene — were already being tackled by the organization through its programmes on water, sanitation, food safety, and education for health. But those efforts would bear fruit only in the longer term. Something had to be done in the meantime to stop young diarrhoea victims from dying not only such an untimely death but a death of such indignity.

In 1978, WHO set up a diarrhoeal disease control programme focused on the immediate goal of reducing these deaths. At the time, medical science rightly recognized that diarrhoea victims were dying essentially from a loss of precious body fluids and salts. It was logical to reverse the dehydration by administering a sophisticated replacement fluid through an intravenous drip. Unfortunately, however, few lives were being saved by this treatment. Intravenous drips are expensive and can be set up only in a health centre or hospital, to which millions upon millions of families had no access at all.

WHO therefore promoted the idea of rehydrating the child with diarrhoea by means of a simple fluid given by mouth. Testing showed that the use of a fluid similar but not identical to that used in intravenous drips can save the life of the vast majority of children with diarrhoea. Only extremely dehydrated children need a drip — but they never reach this critical stage if oral rehydration therapy is started early enough.

"With advice from a health worker, a mother in her own home can give her child spoonfuls of life-saving fluid, which she makes by dissolving pre-mixed oral rehydration 'salts' (essentially sodium, potassium and sugar) in water."

The effectiveness of oral rehydration therapy is matched by its simplicity and accessibility to even the poorest families. With advice from a health worker, a mother in her own home can give her child spoonfuls of life-saving fluid, which she makes by dissolving pre-mixed oral rehydration "salts" (essentially sodium, potassium and sugar) in water. Cheap though these pre-mixed packets are, researchers are busy testing the effectiveness of alternative approaches, such as the use of rice-water and similar ingredients that mothers may have more readily at hand. Families must also be reminded of the crucial importance of continuing to feed the child with diarrhoea: withholding food, however reasonable this seems for a "tired" stomach, has been proved scientifically to be extremely dangerous.

More than 100 countries have now launched programmes for diarrhoeal disease control in the framework of primary health care. By the latest WHO estimate, some 60% of the population of the developing countries now has access to packets of oral rehydration salts, and about one quarter of all diarrhoeal

The operating theatre of a hospital "that would astound most urban doctors". The building itself is subsiding, hence the gaping cracks in the wall. WHO is developing a series of handbooks emphasizing the practical training and equipment needed in small rural hospitals. Using simple but standard surgical techniques and the basic principles of asepsis and pain relief, such hospitals can save many lives at relatively low cost.

episodes are actually treated with oral rehydration. In the developed countries, a small but growing number of hospitals are making use of this simple, effective technology. Like the home treatment of tuberculosis, oral rehydration is an example of a therapy developed and tested in the Third World which has begun to benefit the industrialized world too.

This story has a surprise ending. Experience has now shown that villages with a properly organized programme for diarrhoeal disease control are protected against cholera as well. If it should strike, their death rate is likely to be 2% — as opposed to the 20–40% death rate seen in communities without training and supplies for oral rehydration.

Suffering averted

But for WHO . . .

- since 1975, four million African children born in areas previously infested with blackflies would have risked the slow progression to river blindness;
- since 1977, at least 20 million people would have died of smallpox;
- measles, neonatal tetanus and whooping cough would be killing over a million children a year;
- in 1986 alone, three-quarters of a million children would have died from diarrhoea and dehydration;
- in 1987, as many as 188 000 children would have been stricken with polio and run the risk of lifelong disablement.

The passages above are taken from the chapter on "The fourth decade: 1978–1988" of the WHO publication *Four decades of achievement*. The booklet describes highlights of the work of WHO from 1948 to 1988. The passages and the photographs illustrating this and the following WHO publications are reproduced with the kind permission of WHO.

Four decades of achievement *was published by WHO, Geneva, Switzerland, 1988. pp. 39. ISBN 92 4 154234 9. Price CHF 7-.*

IUPAC's new President

Prof. Yves Jeannin assumed office as President of IUPAC in August at the end of the Lund General Assembly after having served for two years as Vice-President (President-Elect) since his election at the Boston General Assembly.

Prof. Yves P. Jeannin was born in 1931. He received his degrees at the University of Paris. His thesis was prepared with Prof. J. Bénard, a former IUPAC President, and was concerned wtih non-stoichiometric titanium sulfides.

After post-doctoral research fellowships at Argonne National Laboratory (USA) and Iowa State University (USA) he was appointed Lecturer at the University of Paul Sabatier in Toulouse, France. During his 10-year stay there he became interested in coordination and organometallic compounds and the determination of their structures using X-ray diffraction.

In 1974 he moved to Paris as Professor of Inorganic Chemistry at the Universite Pierre et Marie Curie. Here he developed the chemistry of polymetallic species, particularly polymetalates and clusters. The latter were used as models for metal surfaces protected from corrosion by organic inhibitors.

Yves Jeannin in his office at Laboratoire de Chimie des Métaux de Transition, Université Pierre et Marie Curie, where he is Professor of Inorganic Chemistry.

Current research

Jeannin has continued to be fascinated by polynuclear metallic species and organometallic compounds. He is

interested in both homo- and hetero-type polyoxoanions such as polytungstates and polymolybdates. Very large species — the largest containing 48 tungsten atoms — have been made in Jeannin's laboratory. His aim is to make larger species.

These species have a number of potential applications including catalysis; use in the photochemical decomposition of water and photochemical oxidation of alcohols; and finally, for antiviral activity. This work is carried out in a group led by Prof. Hervé.

Polyoxoiron compounds may be compared to polytungstates. A group led by Prof. Massart is investigating these compounds. Some, known as ferro-fluids, can be used as liquid magnets and the preparation of these magnetic colloidal iron oxides has already been patented. The oxides are sold on the market and used for separating minerals and supporting frictionless bearings.

The application of polynuclear coordination compounds to electronics (known as molecular electronics) is another of the research interests of Jeannin's laboratory. A group led by Prof. Launay is trying to synthesize "molecular switches" by stretching organic moities between two metal atoms such as ruthenium atoms which "switch" between two oxidation states.

Other interests include molybdenum species in non-aqueous solvents, polyoxomolybdates with nitrogen containing ligands. Metal carbonyl clusters may be used to mimic the protection of a metal surface by organic inhibitors. This work is carried out in Jeannin's laboratory by a group led by Dr Daran who is presently working on the reaction of aminoalkynes.

Altogether Jeannin has 24 research staff in his department plus 12 PhD research students and 10 technicians. He is the author of over 200 publications including a textbook on physical chemistry which is used by first-year chemistry students in France and in some French-speaking countries.

National and international activities

In 1981, he was elected a corresponding member of the French Academy of Sciences and was chairman of the committee which reviewed the teaching of chemistry in French High Schools. He is currently secretary of the French National Committee for Chemistry. This is the French National Adhering Organization (NAO) to IUPAC. He is chairman of the French Committee for International Scientific Unions.

Within IUPAC, Jeannin became an associate member of the Commission on the Nomenclature of Inorganic Chemistry (II.2) in 1969 and a titular

Jeannin's research has focused on the chemistry of polymetallic species, particularly polymetalates and clusters.

Presidents of IUPAC

Prof. Ch. Moureu	France	1920–22
Sir William Pope	UK	1923–25
Prof. E. Cohen	Netherlands	1926–28
Prof. E. Biilmann	Denmark	1928–34
Prof. N. Parravano	Italy	1934–38
Prof. Marston-Taylor Bogert	USA	1938–47
Prof. H.-R. Kruyt	Netherlands	1947–51
Prof. A. Tiselius	Sweden	1951–55
Prof. A. Stoll	Switzerland	1955–59
Prof. W. A. Noyes, Jr	USA	1959–63
Lord Todd	UK	1963–65
Prof. W. Klemm	Federal Republic of Germany	1965–67
Prof. V. N. Kondratiev	USSR	1967–69
Dr A. L. G. Rees	Australia	1969–71
Prof. J. Benard	France	1971–73
Prof. Sir Harold Thompson	UK	1973–75
Dr R. W. Cairns	USA	1975–77
Prof. G. Smets	Belgium	1977–79
Prof. H. Zollinger	Switzerland	1979–81
Prof. S. Nagakura	Japan	1981–83
Dr W. G. Schneider	Canada	1983–85
Prof. C. N. R. Rao	India	1985–87
Prof. V. A. Koptyug	USSR	1987–89
Prof. Y. P. Jeannin	France	1989–91

member in 1971. He was elected vice-chairman in 1975 and became chairman in 1981. He represented Commission II.2 on the joint IUB (International Union of Biochemistry) — IUPAC Commission from 1977 to 1980 and was a member of the Interdivisional Committee on Nomenclature and Symbols. In 1979 he was elected to the Bureau and became a member of the Executive Committee in 1983.

"The affiliate membership scheme has helped to improve the visibility of IUPAC."

Jeannin is an IUPAC affiliate and strongly supports the membership scheme. He questions, however, whether the scheme has received sufficient support at the highest levels — from Nobel Laureates in chemistry, for example. Even so, he believes that the scheme has improved the visibility of IUPAC and hopes that it will help ensure that IUPAC will continue to attract the best chemists from around the world for its work.

The President recognizes that IUPAC is a fairly rigid body and because its commissions and committees meet rather infrequently the Union can only move slowly. He therefore thinks that the moves towards restructuring are very important.

Concerning the achievements of the Union, he considers that IUPAC's output has been notable — particularly on nomenclature and also atomic weights. Sponsorship of meetings — among them the CHEMRAWN series — has also been a most worthwhile activity. Unfortunately this is not always clear for participants. A recent initiative, following a suggestion by Prof. Saegusa, President of the Macromolecular Division, should improve the situation.

On the other hand, he feels that although the chemical industry may find it difficult to make a strong input into the Union, the industry could use IUPAC more to solve problems, for example, problems of standardization, application of analytical methods and so on. IUPAC is a neutral body which has the potential for producing internationally accepted guidelines and rules for industry. It is not subject to political pressures as national scientific bodies sometimes are. He feels, therefore, that industry is missing a golden opportunity by not using IUPAC to formulate internationally accepted guidelines and rules which governments would be persuaded to implement.

Conferences

Natural products
New Delhi, India
4–9 February 1990

IUPAC SPONSORED

The 17th International Symposium on the Chemistry of Natural Products will comprise plenary lectures, sectional lectures and contributed papers (both oral and poster presentations). These will cover various facets of natural products: isolation; structure elucidation; reactions; synthesis; and biosynthesis. The central theme for the symposium will be natural products chemistry and its social relevance. In this context the following sections will be organized:

- *Natural products and human health*: chemistry of medicinal plants, especially traditional medicine–based; mammalian chemistry; drugs from the sea; antibiotics.
- *Natural products and agriculture*: pesticides; plant hormones; insect chemistry; allelopathy.
- *Natural products and personal sophistication*: essential oils; aroma chemicals; skin and hair chemistry.
- *Bioorganic chemistry*: chemistry of biologically active organic macromolecules.
- *General natural products chemistry*: novel molecules of both terrestrial and marine origin; secondary metabolities by non-conventional techniques.

The official language of the symposium will be English. No simultaneous translation will be provided.

A variety of social events, including ladies programmes and excursions, will be arranged for participants and their guests.

The registration fee for scientific participants is USD 300.00, for accompanying persons and scientific participants from academia of Third World countries USD 150.00, and for students USD 50.00.

Biological and environmental reference materials
Orlando, Florida, USA
5–8 February 1990

IUPAC SPONSORED

The 4th International Symposium on Biological and Environmental Reference Materials (BERM-4) will be held in the Sonesta Village Hotel in Orlando, Florida.

BERM-4 will continue this symposium series being held on an approximate two-year periodic basis. The exchange of ideas and views documented in the *Pro-*

ceedings of the Third Symposium, held in May 1988 at Bayreuth, Bavaria, FRG, covered a wide variety and scope of information in this topic area. Activities at BERM-4 are expected to both broaden these discussions and to focus on more specific aspects of further research on problems and progress of projects discussed at the previous.

There will be 12 plenary lectures: K. Okamoto (Japan); P. Wagstaffe (Belgium); S. Rasberry (USA); D. Wells (UK); P. DeBievre (Belgium); S. Barnett (USA); H. Lento (USA); S. Borman (Canada); T. A. Milne (USA); R. L. Garick (USA); M. Ihnat (Canada); and D. Stamm (FRG).

The major aim of this symposium series is to bring together efforts in the production, study and use of these reference materials in the analytical, biological, biomedical, clinical, environmental, nutritional communities.

Participation in the symposium is open to all who are interested in reference materials and standards in the biological and environmental fields. The registration fee will cover attendance at the symposium, the book of abstracts and the published proceedings as well as other activities. A block of rooms has been set aside for attendees at a special conference rate.

Free radicals in biotechnology and medicine

An International Symposium on Free Radicals in Biotechnology and Medicine will be held at the Scientific Societies' Lecture Theatre, Savile Row, London, on Wednesday 7 February 1990. Introductory lectures will be concerned with the role of free radicals in biotechnology and medicine. These will be followed by several lectures devoted to approaches for the analysis of free radicals.

Details from Miss P. E. Hutchinson, Secretary, The Analytical Division, The Royal Society of Chemistry, Burlington House, London W1V 0BN, UK.

Cereal science and technology

The International Association for Cereal Science and Technology (ICC) will celebrate its 35th anniversary in 1990 and in the same year the American Association of Cereal Chemists (AACC) will celebrate its 75th anniversary.

The two associations have, for the first time, decided to hold a congress jointly and have chosen Vienna, Austria, the seat of ICC, as the venue for this congress which will be held from 29 to 31 May 1990.

The congress has the title "New trends in cereal food" and will cover the following topics: market; raw materials, processing; and nutrition. The meeting will be followed by a symposium on "interaction of cereal components and their implications for the future".

Further information from: 13 ICC-Congress 1990, Vienna, c/o ICC-Secretariat, A-2320 Schwechat, PO Box 77, Austria.

Analysis of anabolizing and doping agents in biosamples

The International Symposium on the Analysis of Anabolizing and Doping Agents in Biosamples will be held at the State University of Ghent, Belgium from 15 to 18 May 1990.

The symposium will cover the following topics: high-pressure liquid chromatography and detection techniques (UV, fluorescence, MS etc.), capillary gas chromatography with special emphasis on GC/MS techniques, immunological analysis (RIA, CLIA, ELISA etc.) and new techniques applied to the detection of anabolizing and doping agents in biosamples; metabolism, pharmacokinetics, toxicology and ecology of these compounds; quality control and reference materials.

Further information may be obtained from: Professor C. Van Peteghem, Symposium Chairman, Laboratory of Food Analysis, State University of Ghent, Harelbekestraat 72, B-9000 Ghent, Belgium. Tel: +32 (91) 218951 Ext. 235. Fax: +32 (91) 2179 02.

Data for discovery

The 12th International CODATA Conference "Data for Discovery" will be held at the Hyatt on Capitol Square Hotel, Columbus, Ohio, USA from 15 to 19 July 1990.

The conference will emphasize the importance of collection, organization, and analysis of large data sets which can lead to new insights into scientific phenomena. In particular, the management aspects of the ICSU Global Change Programme will be highlighted, as well as exploratory molecular manipulation.

CODATA is an interdisciplinary Scientific Committee of the International Council of Scientific Unions (ICSU). The committee seeks to improve the quality, reliability, management, and accessibility of data of importance to all fields of science and technology.

For further details of the conference contact: 12th International CODATA Conference, Applied Information Technologies Institute, 1880 Mackenzie Drive, Suite 111, Columbus, Ohio 43220, USA.

Insect chemical ecology

The International Conference on Insect Chemical Ecology will be held in Palcát Hotel in Tábor, Czechoslovakia from 12–18 August 1989. The conference is

organized by the Institute of Organic Chemistry and Biochemistry and sponsored by the Czechoslovak Academy of Sciences.

The scientific programme will be divided into three sections:

1. Chemical communication in insects;
2. Chemical insect–plant relationships;
3. Prospects of practical application of pheromones and juvenoids.

Further information is available from: Dr Zdenek Wimmer, Institute of Organic Chemistry and Biochemistry, Czechoslovak Academy of Sciences, Flemingovo nám. 2, 166 10 Prague 6, Czechoslovakia.

Genetics of industrial microorganisms

The 6th International Symposium of Genetics of Industrial Microorganisms (GIM 90) will be held at the Palais des Congrès, Strasbourg, France, 12–18 August 1990 under the auspices of the GIM-International Committee. The official language of the symposium will be English.

Further details from: GIM 90, Société Française de Microbiologie, 28 rue du Docteur Roux, 75724 Paris Cédex 15, France.

Polymerization reactions

An International Symposium on the Mechanisms and Kinetics of Polymerization Reactions and their Importance in Polymer Synthesis will take place in Paris, 9–13 September 1990. The symposium is being organized in honour of Prof. P. Sigwalt, on the occasion of his 65th birthday.

The main topics of the symposium are (a) chain polymerization: radical, cationic, anionic, coordination, vinyl and ring opening polymerizations and (b) step growth polymerization.

For further information contact: Dr H. Sekiguchi, Laboratoire de Chimie Macromoleculaire (UA.24), Universite P. et M. Curie, 4 Place Jussieu, 75252 Paris Cedex 05, France.

Crystallography congresses

The 15th IUCr (International Union of Crystallography) General Assembly and International Congress of Crystallography will be held in Bordeaux, France, 19–28 July 1990. *For further information write to: XVth IUCr Congress, Laboratoire de Cristallographie, Universite Bordeau I, 351 cours de la Liberation, 33405 Talence cedex 05, France.*

The 16th IUCr General Assembly and International Congress of Crystallography will be held in Beijing, People's Republic of China, 1–8 September 1993. *In due course further information may be obtained from Prof. M.-C. Shao, Institute of Physical Chemistry, Department of Chemistry, Peking University, Beijing 100871, People's Republic of China.*

Clinical chemistry congress

The 14th International Congress of Clinical Chemistry will be held in San Francisco, USA from 22 to 26 July 1990.

For further information contact: Dr Carl A. Burtis, Chemical Technology Division, Oak Ridge National Laboratory, PO Box 2008, Oak Ridge, TN 37831-6194, USA.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in brackets.

1989

Vapour–liquid equilibria

6–8 September. 5th International Workshop on Vapour–Liquid Equilibria in 1-Alkanol + n-Alkane Mixtures. Trieste, Italy.
(CODATA/IUPAC Conferences, Prof. P. Alessi, Instituto di Chimica Applicata e Industriale, Universitá di Trieste, via Valerio 2, 34127 Trieste, Italy.)

Thin solid and liquid films

11–13 September. International Symposium on Thin Solid and Liquid Films. Bristol, UK.
(SCI Conference Secretariat: Mrs A. Potter (Conference Manager), Society of Chemical Industry, 14/15 Belgrave Square, London SW1X 8PS, UK.)

Electrochemistry

17–22 September. 40th International Society of Electrochemistry Meeting. Kyoto, Japan.
(Prof. Yasuhiko Ito, Secretary General, The 40th ISE Meeting, c/o Kyoto International Con-

ference Hall, Takaraga-ike, Sakyo-ku, Kyoto 606, Japan.)

Flame structure

18–22 September. 3rd International Seminar on Flame Structure (ISFS-89). Alma-Ata, USSR.
(Organizing Committee, Seminar on Flame Structure, Institutskaya Street 3, Novosibirsk 630090, USSR.)

Nitroxide radicals

18–22 September. International Conference on Nitroxide Radicals (ICNR-89). Novosibirsk, USSR.
(Dr V. V. Martin, Secretary of ICNR-89, Institute of Organic Chemistry, Siberian Division of the Academy of Sciences of the USSR, Novosibirsk-630090, USSR.)

Organometallic chemistry

1–6 October. 5th International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS V). Florence, Italy.
("OMCOS-V", Dipartimento di Chimica Organica, University of Florence, Via G. Capponi, 9-50121 Florence, Italy.)

1990

Natural products

4–9 February. 17th International Symposium on the Chemistry of Natural Products. New Delhi, India.
(Dr A. V. Rama Rao, Secretary, 17th IUPAC International Symposium on the Chemistry of Natural Products, Regional Research Laboratory, Hyderabad 500 007, India.)

Biological and environmental reference materials

5–8 February. 4th International Symposium on Biological and Environmental Reference Materials (BERM-4). Orlando, Florida, USA.
(Dr Wayne R. Wolf, Nutrient Composition Laboratory, Beltsville Human Nutrition Research Center, Agricultural Research Service, US Department of Agriculture, Beltsville, MD 20705, USA.)

Porous solids

6–9 May. 2nd International Symposium on Characterization of Porous Solids (COPS-2). Alicante, Spain.
(Prof. F. Rodriguez-Reinoso, Departamento de Quimica Inorgánica e Ingenieria Química, Facultad de Ciencias, Universidad de Alicante, Apartado 99, Alicante, Spain.)

Carotenoids

20–25 May. 9th International Symposium on Carotenoids. Kyoto, Japan.
(Prof. Masayoshi Ito, Kobe Women's College of Pharmacy, 4-19-1, Motoyamakita-Machi, Higashinada-ku, Kobe 658, Japan.)

Polymer networks

21–25 May. 10th International Symposium on Polymer Networks. Jerusalem, Israel.
(Prof. Moshe Gottlieb, Chemical Engineering Department, Ben Gurion University, Beer Sheva 84105, Israel.)

Trace elements in health and disease

5–8 June. International Symposium on Trace Elements in Health and Disease. Helsinki, Finland.
(Trace Elements in Health and Disease, A joint NTES–COMTOX Meeting, Symposium Secretariat, Institute of Occupational Health, Topeliuksenkatu 41 a A, SF-00250 Helsinki, Finland.)

Ceramics

24–30 June. 7th World Ceramic Congress. Rimini, Italy.
(7th CIMTEC, World Ceramics Congress, PO Box 174–48018 Faenza, Italy.)

Macromolecules

8–13 July. 33rd International Symposium on Macromolecules. Montreal, Canada.
(Prof. R. E. Prud'homme, Department of Chemistry, Laval Unviersity, Sainte-Foy, Québec, Canada G1K 7P4.)

Mechanisms of polymer strength and toughness

16–19 July. 13th Discussion Conference on Macromolecules Mechanisms of Polymer Strength and Toughness. Prague, Czechoslovakia.
(13th Discussion Conference, PMM Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 16206 Prague, Czechoslovakia.)

Photochemistry

22–28 July. 13th IUPAC International Symposium on Photochemistry. Warwick, UK.
(Prof. F. D. Lewis, Department of Chemistry, Northwestern University, 2145 Sheridan Road, Evanston, IL 60208, USA.)

Polymer analysis and characterization

23–25 July. 3rd International Symposium on Polymer Analysis and Characterization. Brno, Czechoslovakia.
(Dr Howard G. Barth, Du Pont Company, Experimental Station, Wilmington, Delaware, 1989, USA.)

Organic synthesis

23–27 July. 8th International Conference on Organic Synthesis. Helsinki, Finland.
(Prof. T. A. Hase, c/o Travel Experts Limited, PO Box 722, SF-00101 Helsinki, Finland.)

Boron chemistry

30 July–3 August. 7th International Meeting on Boron Chemistry – IMEBORON VII. Torun, Poland.
(Prof. Marek Zaidlewicz, Institute of Chemistry, Nicolaus Copernicus University, 7 Gargarin Street, 87-100 Torun, Poland.)

Pesticide chemistry

5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, FRG.
(Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-6000 Frankfurt/Main 90, FRG.)

Physical organic chemistry

6–10 August. 10th International Conference on Physical Organic Chemistry. Haifa, Israel.
(Prof. Yitzhak Apeloig, Department of Chemistry, Technion-Israel Institute of Technology, Haifa, 32000, Israel.)

Raman spectroscopy

13–17 August. 12th International Conference on Raman Spectroscopy. Columbia, South Carolina, USA.
(Prof. J. R. Durig, Department of Chemistry, University of South Carolina, Columbia, South Carolina 29208, USA.)

Coordination chemistry

13–18 August. 28th International Conference on Coordination Chemistry. Gera, GDR.
(Dr D. Walther, Sektion Chemie der, Friedrich-Schiller-Universität, Steiger 3, Haus 111, Jena 6900, GDR.)

Chemical thermodynamics

27–31 August. 11th IUPAC Conference on Chemical Thermodynamics. Como, Italy.
(11th IUPAC Conference on Chemical Thermodynamics, c/o Dip. to Chimica Fisica Applicata, Politecnico di Milano, Via Golgi, 39, 20133 Milano MI, Italy.)

Polymerization reactions

9–13 September. International Symposium on Mechanisms and Kinetics of Polymerization Reactions: Their Use in Polymer Synthesis. Paris, France.
(Professor E. Maréchal, Laboratoire de Synthèse Macromolécykaurem 12 rye Cuvier, 75005 Paris, France.)

Safety in chemical production

10–13 September. Ist IUPAC Workshop on Safety in Chemical Production. Basel, Switzerland.
(This workshop is not open for general participation but restricted to a limited number of invited participants.)

Automation and new technology in the clinical laboratory

9–12 October. 4th International Congress on Automation and New Technology in the Clinical Laboratory. Barcelona, Spain.
(Dr Roman Galimany, Secciódе Automatizaci ón, Servicio de Bioquímica, Residencia Sanitaria Germans Trias i Pujol, Carretera Canyet s/n, 08916 Barcelona, Spain.)

Speciality polymers

7–9 November. International Symposium on Speciality Polymers. Singapore.
(International Symposium on Speciality Polymers, c/o Department of Chemistry, National University of Singapore, 10 Kent Ridge Crescent, Singapore 0511.)

1991

Polymer materials

10–15 February, Polymer 91: International Symposium on Polymer Materials: Preparation, Characterization and Properties. Melbourne, Australia.
(Prof. J. H. O'Donnell, Department of Chemistry, University of Queensland, Brisbane 4067, Queensland, Australia.)

"Organic chemistry: technological perspectives"

15–19 April. 2nd International Symposium "Organic Chemistry: Technological Perspectives". Baden-Baden, FRG.
(Dr W. Fritche, Gesellschaft Deutscher Chemiker, Varrentrappstrasse 40-42, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Organometallic chemistry

25–29 August. 6th International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS). Utrecht, Netherlands.
(Prof. G. van Koten, Laboratory of Organic Chemistry, Department of Metal Mediated Synthesis, University of Utrecht, Padualaan 8, 3584 CH Utrecht, Netherlands.)

Analytical sciences

25–31 August. International Congress on Analytical Sciences. Chiba, Japan.
(Prof. Eiji Niki, The Japan Society for Analytical Chemistry, 1-26-2-304 Nishigotanda, Shinagawa, Tokyo 141, Japan.)

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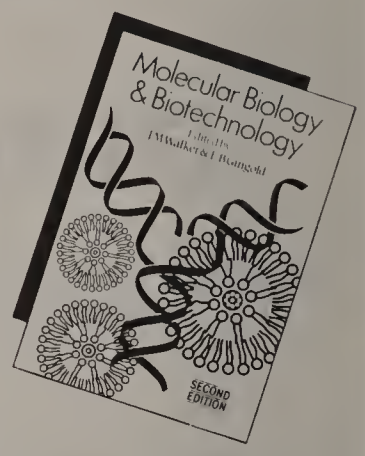

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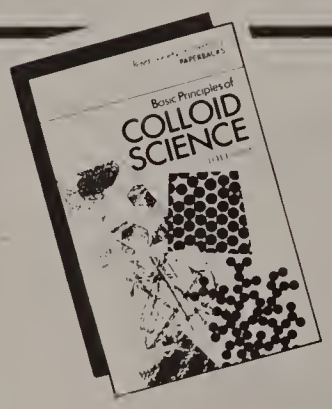

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 43 countries, each represented by a national organization, such as an academy of science or research council.

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Chemistry International

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Front Cover: The whey to make butter — see page 214. *(Photo courtesy National Dairy Council, UK.)*

1989 International Union of Pure and Applied Chemistry

IUPAC 1988

Dr Maurice Williams

Each year, IUPAC Executive Secretary Dr Maurice Williams, prepares a report on IUPAC activities for the International Council of Scientific Unions (ICSU). The following is his 1988 report.

Restructuring

For IUPAC, 1988 was a non-general assembly year. The business of the union was conducted through meetings of the Executive Committee (Moscow, May), Bureau (Oxford, September), and Division Presidents (Oxford, September).

Discussions were continued on how IUPAC might be restructured in order to respond more readily and effectively to the changing needs of chemistry, and chemistry related to mankind's needs, without losing its ability to perform its present duties. It was decided that the present division structure of IUPAC should be maintained. However, each division should restructure according to its needs, in order to discharge more efficiently its duties and particularly to place itself in a position to respond to the changing needs of chemistry, especially on the interdisciplinary scene. Such changes should not disrupt the ongoing programme of a division: the evolution should be progressive. The introduction of limited lifetime subcommittees or commissions was desirable.

The IUPAC Bureau met in Oxford in September 1988.

Moscow: venue of the executive Committee in May 1988.

The Executive Committee will act as a forward planning group for IUPAC as a whole. Its discussions in this respect should centre on the identification of new emerging topics in chemistry or chemistry-related sciences and the injection of such new programmes into the existing ones of the divisions. In this role the Executive Committee should also be concerned with external relations with other unions of ICSU, with ICSU itself, and with the programmes of its scientific and special committees.

Whilst maintaining the present 'vertical' disciplinary format of the divisions, a 'horizontal' interdisciplinary mission-orientated structure, involving several divisions/commissions, should be introduced. Ideally, there should be at least three such horizontal programmes in place at any one time. These horizontal mission-orientated programmes should be of limited lifetime and would require priority funding. Topics worthy of consideration include:

- chemistry and the environment
- chemistry and the biosciences
- chemistry and safety
- new materials chemistry
- evolution of a new systematic computer-compatible nomenclature system for chemical compounds with participation from computer specialists.

Transfermium elements

Following an earlier, but unsuccessful inter-union attempt to solve the contentious matter of nomenclature for the transfermium elements, a new IUPAC–IUPAP (International Union of Pure and Applied Physics) working group was established. Its task is to be approached in two stages, the first being the establishment of criteria which must be satisfied for the discovery of new chemical elements to be recognized, and the second being the application of those criteria in practical cases.

IUPAC will retain responsibility for recommending names for chemical elements: discussion of the names for elements 102 and 103 will not be reopened, but that for element 104 onwards remains open. The three major world laboratories involved in the actual research — at Berkeley (USA), Darmstadt (FRG), and Dubna (USSR) — expressed themselves willing or eager to receive the group or help with its work. Darmstadt was visited in December 1988 and it is planned to visit the other two during 1989.

Latin American initiative

Following discussions within the Federación Latinoamericana de Asociaciones Químicas, a proposal was drafted in Latin America for an IUPAC initiative there. The draft outlined objectives and strategies for the programme, an organizational structure (based on National Focal Points and a Directive Council), and various activities (post-graduate courses, workshops, post-graduate fellowships, exchange visitors).

Two of the six Directive Council members are to be appointed by IUPAC, which will also be involved in selection of the other four members. The council will receive suggestions for activities under the programme from the National Focal Points, and it will review the progress of the activities once started. IUPAC supported the proposal for submission for funding and technical assistance from relevant international agencies.

COCI and CHEMRAWN

The Committee on Chemistry and Industry (COCI) reached an advanced stage in planning the first IUPAC Workshop on Safety in Chemical Production (Basle, 1990.09.09–13).

Most other international organizations, concerned with safety in chemical production, have concentrated on matters affecting protection of the population living near chemical plants or on methods of risk assessment and reduction. However, COCI believes that an important contribution can be made to enhance safety of chemical plants by starting an educational process through workshops, in which subject experts can pass on their knowledge to appropriate audiences, including teachers of general chemistry in higher eduction establishments, opinion leaders/decision makers in government and in chemical industry. This workshop

CHEMRAWN Committee meeting in London, March 1988. Preliminary plans have been drawn up for CHEMRAWN VII: Chemistry of the Atmosphere.

in Western Europe will be the first of a series in various parts of the world, which will build on its own achievements.

Noting that fluorocarbon/ozone interaction in the upper atmosphere had become a world health problem and that international agreement on emissions was urgently needed, the CHEMRAWN Committee concluded that scientific consensus and international cooperation was the preferred path to proper planning for an orderly transition to alternate technologies. Preliminary plans were accordingly drawn up for CHEMRAWN VII: The Chemistry of the Atmosphere — Its Impact on Global Changes. An extensive programme to take place, probably in North America in 1990, foresees the involvement of UNEP (United Nations Environment Programme), WMO (World Meteorological Organization), and ICSU. By then other existing initiatives should have progressed sufficient for CHEMRAWN VII to provide a valuable overall forum.

Affiliate scheme

The total membership of the IUPAC affiliate membership scheme for 1988 (7532 — 91 countries) was slightly down on that for 1987 (7843 — 80 countries). A decrease of nearly 500 for the USA seemed to reflect the rise in the IUPAC component of the affiliate subscription approved by the Council (Boston, 1987). It was agreed that affiliates, who have the necessary expertise and who come from IUPAC non-member countries, might in future become members of working parties or subcommittees of commissions. At present, only chemists from member countries may be associate or titular members of commissions or members of division committees.

Recommendations and reports

A considerable range of recommendations and reports was published during the year by IUPAC bodies (see Appendix). These included three major works, namely

the third edition of the "Green Book" — *Quantities, units and symbols in physical chemistry*; *Determination of trace metals in natural waters*; *Pesticide metabolism: Extrapolation from animals to man.*

Eight more volumes appeared in the *Solubility data series* (SDS), bringing the total to date to 38. A further contract was signed with Pergamon Press, continuing publication of SDS with it until the end of 1992.

A new series of IUPAC books was created under the banner *Chemistry for the 21st Century*, and the first volume therein was issued: *Chemistry of oxide superconductors.*

Considerable progress was made, in conjunction with the WHO (World Health Organization) International Programme on Chemical Safety, towards an authoritative monograph dealing with the safe use and disposal of chemicals in laboratories throughout the world.

Arrangements were agreed with the official publisher to IUPAC (Blackwell Scientific Publications), for exclusive dissemination of the first IUPAC database (enthalpies of vaporization: previously only available in bookform) as a diskette for personal computers, including search and retrieval software. However, IUPAC intends to pursue a policy of non-exclusive licences to online vendors.

Appendix

The following recommendations on nomenclature and symbols were published in 1988:

1. Glossary of terms used in photochemistry (Recommendations 1988), *Pure Appl. Chem.*, **60**, 1055–1106 (1988) — Commission on Photochemistry.
2. Names for hydrogen atoms, ions, and groups, and for reactions involving them (Recommendations 1988), *Pure Appl. Chem.*, **60**, 1115–1116 (1988) — Commission of Physical Organic Chemistry.
3. Presentation of molecular parameter values for infrared and raman intensity measurements (Recommendations 1988), *Pure Appl. Chem.*, **60**, 1385–1388 (1988) — Commission on Molecular Structure and Spectroscopy.
4. Nomenclature of glycoproteins, glycopeptides and peptidoglycans (Recommendations 1988), *Pure Appl. Chem.*, **60**, 1389–1394 (1988) — IUPAC–IUB Joint Commission on Biochemical Nomenclature.
5. Nomenclature for cyclic organic compounds with contiguous formal double bonds (The Delta-Convention)(Recommendations 1988), *Pure Appl. Chem.*, **60**, 1395–1401 (1988) — Commission on Nomenclature of Organic Chemistry.
6. Nomenclature, symbols, units and their usage in spectrochemical analysis — VII: molecular absorption spectroscopy, ultraviolet and visible (UV/VIS)(Recommendations 1988), *Pure Appl. Chem.*, **60**, 1449–1460 (1988) — Commission on Spectrochemical and Other Optical Procedures for Analysis.
7. Nomenclature, symbols, units and their usage in spectrochemical analysis — X: preparation of materials for analytical atomic spectroscopy and other related techniques (Recommendations 1988), *Pure Appl. Chem.*, **60**, 1461–1472 (1988) — Commission on Spectrochemical and Other Optical Procedures for Analysis.

The following technical reports by IUPAC bodies were published during the year:

1. New notations in the periodic table, *Pure Appl. Chem.*, **60**, 431–436 (1988) — Inorganic Chemistry Division.
2. Critical evaluation of calibration procedures for distribution analysis of dopant elements in silicon and gallium arsenides, *Pure Appl. Chem.*, **60**, 437–444 (1988) — Commission on Microchemical Techniques and Trace Analysis.
3. Atomic weights of the elements 1987, *Pure Appl. Chem.*, **60**, 841–854 (1988) — Commission on Atomic Weights and Isotopic Abundances.
4. Protocol for the design, conduct and interpretation of collaborative studies, *Pure Appl. Chem.*, **60**, 855–864 (1988) — Interdivisional working Party for Harmonization of Quality Assurance Schemes for Analytical Laboratories.
5. Recommendations for the determination of pH in sea water and estuarine waters, *Pure Appl. Chem.*, **60**, 865–870 (1988) — Commission on electroanalytical Chemistry.
6. A collaborative study of HPLC methods for the determination of patulin in apple juice, *Pure Appl. Chem.*, **60**, 871–876 (1988) — Commission on Food Chemistry.

Profs. Tom Cvitaš (left) and Ian Mills who were involved in the preparation of *Quantities, units and symbols in physical chemistry*.

7. Determination of tocopherols and tocotrienols in vegetable oils and fats by high performance liquid chromatography: results of a collaborative study and the standardised methods, *Pure Appl. Chem.*, **60**, 877–892 (1988) — Commission on Oils, Fats & Derivatives.

8. Determination of copper, iron and nickel in oils and fats by direct graphite furnace atomic absorption spectrometry: results of a collaborative study and the standardised methods, *Pure Appl. Chem.*, **60**, 893–900 (1988) — Commission on Oils, Fats & Derivatives.

9. IUPAC reports on pesticides (24) — recommended approach to the evaluation of the environmental behaviour of pesticides, *Pure Appl. Chem.*, **60**, 901–932 (1988) — Commission on Agrochemicals.

10. Reference materials for fluorescence measurement, *Pure Appl. Chem.*, **60**, 1107–1114 (1988) — Commission on Photochemistry.

11. Long and short chain branching frequency in low density polyethylene (LDPE), *Pure Appl. Chem.*, **60**, 1403–1415 (1988) — Commission on Polymer Characterization and Properties.

12. Separation and preconcentration of trace substances — V: microscale preconcentration techniques for trace analysis, *Pure Appl. Chem.*, **60**, 1417–1424 (1988) — Commission on Microchemical Techniques and Trace Analysis.

13. Determination of traces of thallium in various matrices, *Pure Appl. Chem.*, **60**, 1525–1436 (1988) — Commission on Microchemical Techniques and Trace Analysis.

14. Extraction, clean-up and group separation techniques in organochlorine trace analysis, *Pure Appl. Chem.*, **60**, 1437–1448 (1988) — Commission on Microchemical Techniques and Trace Analysis.

15. Interpretation of speciation measurements — a case study: direct polarographic determination of O_2, Fe(II), Mn(II), S(−II) and related species in anoxic waters, *Pure Appl. Chem.*, **60**, 1535–1548 (1988) — Subcommittee on Environmental Analytical Chemistry.

16. *Quantities, units and symbols in physical chemistry* (published in book form by Blackwell Scientific Publications, Oxford, 1988) — Commission on Physicochemical Symbols, Terminology and Units.

17. International thermodynamic tables of fluid state — Vol. 10: *Ethylene* (Ethene) — (published in book form by Blackwell Scientific Publications, Oxford, 1988) — Commission on Thermodynamics.

18. *Determination of trace metals in natural waters* (published in book form by Blackwell Scientific Publications, Oxford, 1988) — Analytical Chemistry Division.

19. Solubility data series: Vol. 31 — *Alkali metal orthophosphates* (published in book form by Pergamon Press, Oxford, 1988) — Commission on Solubility Data.

20. Solubility data series: Vol. 32 — *Hydrogen sulfide, deuterium sulfide and hydrogen selenide* (published in book form by Pergamon Press, Oxford, 1988) — Commission on Solubility Data.

21. Solubility data series: Vol. 33 — *Molten alkali metal alkanoates* (published in book form by Pergamon Press, Oxford, 1988) — Commission on Solubility Data.

22. Solubility data series: Vol. 34 — *4-Aminobenzenesulfonamides*: *Part I: non-cyclic substituents* (published in book form by Pergamon Press, Oxford, 1988) — Commission on Solubility Data.

23. Solubility data series: Vol. 35 — *4-Aminobenzenesulfonamides*: *Part II: 5-membered heterocyclic substituent* (published in book form by Pergamon Press, Oxford, 1988) — Commission on Solubility Data.

24. Solubility data series: Vol. 36 — *4-Aminobenzenesulfonamides*: *Part III: 6-membered heterocyclic substituents and miscellaneous systems* (published in book form by Pergamon Press, Oxford, 1988) — Commission on Solubility Data.

25. Solubility data series: Vol. 37 — *Hydrocarbons with water and seawater*: *Part I: hydrocarbons C_5 to C_7* (published in book form by Pergamon Press, Oxford, 1988) — Commission on Solubility Data.

26. Solubility data series: Vol. 38 — *Hydrocarbons with water and seawater*: *Part II: hydrocarbons C_8 to C_{36}* (published in book form by Pergamon Press, Oxford, 1988) — Commission on Solubility Data.

27. *Pesticide metabolism: extrapolation from animals to man* (published in book form by Blackwell Scientific Publications, Oxford, 1988) — Commission on Pesticide Chemistry.

28. *Chemistry of oxide superconductors* (published in book form by Blackwell Scientific Publications, Oxford, 1988).

Twenty-seven symposia were sponsored by IUPAC in 1988:

1. 3rd International Symposium on Biological Reference Materials, Bayreuth/FRG, May, *Fresenius' Zeit. Analyt. Chem.*, **332**, (6), 1988.

2. 1st International Symposium on Drugs in Competitive Athletics, Brioni Islands/Yugoslavia,

May–June (Proceedings to be published as a book by Blackwell Scientific Publications, Oxford, 1989).

3. 16th International Symposium on the Chemistry of Natural Products, Kyoto/Japan, May–June, *Pure Appl. Chem.*, **61**, (3), 1989.
4. 6th International Conference on Surface and Colloid Science, Hakone/Japan, June, *Pure Appl. Chem.*, **60**, (1), 1988.
5. 7th International Conference on Organic Synthesis, Nancy/France, July, *Pure Appl. Chem.*, **60**, (11), 1988.
6. 11th Discussion Conference: Chemical and Physical Phenomena in the Ageing of Polymers, Prague/Czechoslovakia, July (Proceedings published as Vol. 27 in the Series Macromolecular Symposia to *Die Makromolekulare Chemie* by Hüthig & Wepf Verlag, Basel, 1989).
7. 12th International Symposium on Photochemistry, Bologna/Italy, July, *Pure Appl. Chem.*, **60**, (7), 1988.
8. 7th Bratislava Conference on Modified Polymers, Bratislava/Czechoslovakia, July (Proceedings published as Vol. 28 in the Series Macromolecular Symposia to *Die Makromolekulare Chemie* by Hüthig & Wepf Verlag, Basel, 1989).
9. 8th International Biotechnology Symposium, Paris/France, July (Proceedings published by Société Française de Microbiologie, Paris, 1989).
10. 31st Microsymposium on Macromolecules: Poly(vinyl Chloride), Prague/Czechoslovakia, July (Proceedings to be published as Vol. 29 in the Series Macromolecular Symposia to *Die Makoromolekulare Chemie* by Hüthig & Wepf Verlag, Basel, 1989).
11. 5th International Symposium on Inorganic Ring Systems, Amherst, MA/USA, August (Proceedings to be published in *Phosphorus & Sulfur* by Gordon & Breach, New York, 1989).
12. 7th International Symposium on Mycotoxons and Phycotoxins, Tokyo/Japan, August, *Pure Appl. Chem.*, **61**, (1), 1989.
13. 14th International Carbohydrate Symposium, Stockholm/Sweden, August (to be published in *Pure Appl. Chem.*, 1989).
14. 19th International Conference on Solution Chemistry, Lund/Sweden, August, *Pure Appl. Chem.*, **60**, (12), 1988.
15. 9th International Congress on Thermal Analysis, Jerusalem/Israel, August (to be published in *Pure Appl. Chem.*, 1989).
16. 9th International Conference on Physical Organic Chemistry, Regensburg/FRG, August, *Pure Appl. Chem.*, **61**, (4), 1989.
17. 3rd International Symposium on Solubility Phenomena, Guildford/UK, August, *Pure Appl. Chem.*, **61**, (2), 1989.
18. 26th International Conference on Coordination Chemistry, Porto/Portugal, August/September, *Pure Appl. Chem.*, **61**, (5), 1989.
19. International Symposium on the Electronic Structure and Properties of Molecules and Crystals, Dubrovnik-Cavtat/Yugoslavia, August/September (to be published in *Pure Appl. Chem.*, 1989).
20. 10th International Conference on Chemical Thermodyanics, Prague/Czechoslovakia, August/September, *Pure Appl. Chem.*, **61**, (6), 1989.
21. 11th International Conference on Raman Spectroscopy, London/UK, September (Proceedings published as a book by John Wiley, Chichester, 188).

Tokyo (left) was the venue of the 7th International Symposium Mycotoxins and Phycotoxins. The 14th International Carbohydrate Symposium was held in Stockholm (right). IUPAC sponsored 27 symposia in 1988.

22. 3rd International Congress on Automation and New Technology in The Clinical Laboratory, Kobe/Japan, September (Proceedings to be published as a book by Blackwell Scientific Publications, Oxford, 1989).
23. 4th International Conference on Nickel Metabolism and Toxicology, Espoo/Finland, September (Proceedings to be published by John Wiley, New York, 1989).
24. 13th International Symposium on Macrocyclic Chemistry, Hamburg/FRG, September (to be published in *Pure Appl. Chem.*, 1989).
25. 13th International Conference on Organometallic Chemistry, Turin/Italy, September (to be published in *Pure Appl. Chem.*, 1989).
26. 4th International Workshop on Vapor–Liquid Equilibria in 1-Alkanol + n-Alkane Mixtures: Applications, Thessaloniki/Greece, October (to be published in *Pure Appl. Chem.*, 1989).
27. International Symposium on Surface Chemistry, Adsorption and Chromatography (Dedicated to the Memory of A. V. Kiselev), Moscow/USSR, November (Proceedings to be published in *Pure Appl. Chem.*, 1989).

News & Views

20th FECS General Assembly

The 20th General Assembly of the Federation of European Chemical Societies (FECS) was held in Ghent, Belgium on 16th June, 1989. Fifteen of the 37 member societies from 27 countries were represented. An application for membership from the Chemistry Section of the Academy of Romania was approved.

In addition to the annual report of the Federation, written reports were received from nine Working Parties (Analytical Chemistry, Chemical Education, Chemstry and the Environment, Computational Chemistry, Electrochemistry, Food Chemistry, History of Chemistry, Organometallic Chemistry, and Professional Affairs), the Discussion Group on Conservation of the Cultural Heritage, and the Network on Chemistry for Developing Countries. There were no proposals for new working parties.

The Council, which acts for the Federation during intervals between the general assemblies, will be chaired for the next period by Dr W. Fritsche (Gesellschaft Deutsche Chemiker, FRG). Prof. Y. Inel (Turkish Chemical Society) and Dr R. Darms (Swiss Committee for Chemistry) continue as Council members, and four vacancies were filled by Dr C. Barré (Société Françaises de Chimie), Dr V. Chvalovsky (Czechoslovak Chemical Society), Ir. E. J. de Ryck van der Gracht (Royal Netherlands Chemical Society), and Prof. E. Fanghänel (Chemische Gesellschaft der DDR).

A proposal from the USSR All-Union Mendeleev Society was approved for the establishment of a subgroup, under the auspices of the Working Party on Chemical Education, on the education of young people. The subgroup will be particularly involved in finding ways and means

- for an early exposure to chemistry of gifted children with an inclination to science
- to develop their interest in chemistry
- to provide professional orientation and further support during their professional training and early professional career.

Cooperation with the IUPAC Committee on Teaching of Chemistry may be sought.

A short, but interesting presentation was made by the Young Flemish Chemical Society, a Section of the Flemish Chemical Society which organizes and coordinates activities for young chemists in the Flanders region of Belgium. As a first step towards contacting young chemists in other countries, it coorganized a summer congress in August with their Dutch colleagues. Eventually, it is hoped that young persons from all over Europe will meet and form a Young European Chemical Society (YECS) as a forum to exchange their scientific and general ideas. Young people are felt to be more open to new ideas and new ways of thinking, and less constrained by national interests and their priorities.

A paper from the Working Party on Professional Affairs discussed the concept of the title "European Chemist", and the necessary system of national societies to scrutinize and assess academic qualifications, including professional development — gaining practical experience — to complement such qualifications. The Federation will not pursue the matter at this stage, but keep it under review in case circumstances change and there is a need for urgent action.

A letter on the subject of dumping of chemical wastes, received from the President of the Organization of African Unity, was discussed. The Federation agreed that an exporting and importing licence issued by the respective governments should be the minimum requirement for the transfer of toxic wastes, and it would recommend this to the United Nations Environment Programme. Unfortunately, no progress has yet been made towards combining the long-established EUCHEM conferences with those sponsored by the Federation (FECHEM conferences).

Dr M. Williams
IUPAC Executive Secretary

◄ Prof. Giancarlo Jommi (Italian Chemical Society) presides at the FECS General Assembly, while Dr Jack Gow (UK Royal Society of Chemistry and a Federation General Secretary) takes notes and Prof. S. Raitcheva (Bulgaria) listens.

Prof. N. Schamp (Flemish Chemical Society) — on the left — who made the local arrangements in Gent, and Prof. D. Meyerstain (President, Israel Chemical Society), an observer at the assembly — in the centre. ▲

The FECS General Assembly was held in the Pand, an ancient monastery in Gent. ►

Prof. Yuri A. Ustynyuk (Vice-President, All-Union Mendeleev Society) who presented the proposal on education of young people, with Filip de Corte — on the right — a chemistry PhD student at Gent University, who spoke about YECS. ▼

▲ Dr Wolfgang Fritsche (right), the new chairman of the FECS Council. Next to him is Prof. Gabor Naray-Szabo (Hungarian Chemical Society), one of the two general secretaries of the Federation.

We try to please

If you find mistakes in *Chemistry International* please remember they are there for a reason. We try to cater for a wide range of interests, and some readers are always looking for mistakes. Hopefully they will not be disappointed with this issue.

Applications invited for environment award

In June 1986, the European Council of Chemical Industry Federation (CEFIC) — the Brussels-based organization representing all the 15 National Chemical Federations in Western Europe — created the "Cefic Environment Award". It was first presented in 1988 on the occasion of the closure of the European Year of the Environment.

The 1990 award is to be presented in Brussels in Spring 1990.

The prize of 25.000 Ecus is intended to recognize an outstanding innovation enabling the chemical industry to help solve an environmental problem. Entries will be accepted from individual persons or groups until the closing date of 8 January, 1990.

The award jury will comprise six eminent personalities from academia, industry and European authorities.

The work subject of the application must be presented in a dossier containing all necessary information: report written by the applicant(s); paper(s) published or accepted for publication in recognized scientific journals, third-party evaluation report, and so on. The work can be presented in any of the languages of the countries represented in CEFIC, but a summary in english is to be provided.

The jury may ask for further information from the applicant; it may also want to check the relevance or veracity of the information supplied.

Further information may be obtained from: CEFIC, European Chemical Industry Federation, Technical Affairs Directorate, Av. Louise 250, box 71, 1050 Brussels, Belgium. Tel: +32 (2) 640 20 95. Fax: +32 (2) 640 19 81. Telex: 62444.

Evening primrose and the whey to make butter

Evening primrose oil was the subject of two papers presented at the Second International Conference on Fats for the Future held at the University of Auckland, New Zealand in February 1989 — a meeting sponsored by IUPAC and the Royal Society of New Zealand and organized by the Oils & Fats Specialist Group of the New Zeland Institute of Chemistry.

Dr David F. Horrobin (Efamol Research Institute, UK) reported that the seed oil (Efamol) from specially

IUPAC affiliate and Bureau member Prof. Arthur Campbell (University of Otago, New Zealand) was official IUPAC representative at the 2nd International Conference on Fats for the Future, held in Auckland, New Zealand. Over 200 participants from about 20 countries attended the meeting.

A milking parlour: The conference session on dairy lipids included a paper by Dr A. K. H. MacGibbon (New Zealand Dairy Research Institute) on variation in the properties of milkfat. (*Photo courtesy National Dairy Council, UK.*)

selected varieties of the evening primrose has been found to be clinically effective in double blind, placebo controlled trials in atopic eczema, premenstrual syndrome, diabetic neuropathy and rheumatoid arthritis. According to Horrobin, it is believed that this clinical efficacy is related to the presence of gammalinolenic acid (GLA).

Horrobin's paper was entitled "Evening primrose, blackcurrant, borage and fungal sources of gammalinolenic acid (GLA): clinical uses". In the same session at the conference, Dr R. A. Gibson (Flinders Medical Centre, South Australia) presented a paper on the "Treatment of atopic eczema with evening primrose oil". Gibson reported on a double blind placebo controlled cross-over trial involving 25 school children (mean age eight years) with typical history and skin features of atopic eczema.

The whey to make cocoa butter

In a session on the commercial utilization of lipids Mr J. Davies (DSIR, New Zealand) presented a paper with the intriguing title "The whey to make cocoa butter".

He told the conference that functional fats that can substitute for cocoa butter for use in chocolate making, cosmetics and pharmaceuticals can be found in shea, illipe and other topical nuts. These can be formulated as cocoa butter equivalents for use in the confectionery industry.

Davies reported that DSIR has developed a fermentation process using a common yeast, Trichosporan cutaneum, to grow on cheese whey and accumulate oil with similar properties to cocoa butter.

The process takes cheese whey (a by-product of the cheese and casein production industries), which has the necessary high carbon, low nitrogen ratio to induce oil production. The yeast, which accumulates approximately 35–40% of its dry weight as oil in the whey, is separated by centrifugation and the oil extracted from the issuing yeast cell cream by using a unique combination of mechanical disruption and solvent extraction.

What a load of rubbish!

Have you had difficulty getting through on the telephone to the IUPAC Secretariat recently? If you got through was there a lot of background noise? Perhaps you have visited Bank Court Chambers over the past few months and regretted that you did not bring a torch. Did you not receive a cup of tea or did you find the toilets were out of action?

Don't blame staff at the IUPAC Secretariat — but see page 228.

We regret to record the death of:

Prof. G. Hardy, Hungary (22 October 1988) — Macromolecular Division Committee (1976–1989).

How the language of chemistry developed

Dr Claus Priesner

How has the language of chemistry evolved? In this article, Clause Priesner looks at the development of chemical nomenclature, formulas and atomic theory during the 19th century. The article coincides with the 70th anniversary of IUPAC.

The language of chemistry

Anyone working in chemistry nowadays can take it for granted that others in the profession, when confronted with an expression such as "bicyclo[4.2.0]octadiene(2,4)", can assign to it a formula which will look the same in every case. This apparently obvious statement implies both a universal understanding with regard to the naming of individual substances, and the existence of a generally agreed convention for writing formulas.

These two conditions are only possible if there is a universally accepted description of the main features of the structure of matter and of the interactions between different substances. This description embraces not only all known compounds and reactions, but also all those that are so far unknown, and we call it chemical theory. The conventions for writing formulas, the nomenclature of compounds, and the concepts used in systematically describing reactions (e.g. "nucleophilic substitution") are expressions of this underlying theory, and constitute the language of chemistry.

It is clear from this that chemical language and chemical theory are mutually interdependent. This was by no means always the case. If we accept that mankind has now been aware of chemical processes and engaged in trying to understand them for about 2000 years, then for most of the time this has been

Claus Priesner was born in 1947 in Munich, FRG and studied chemistry at Munich University. He worked as an historian of chemistry at the Deutsches Museum Munich and then joined the Historical Commission (New German Biography) at the Bavarian Academy of Sciences. His address is: Neue Deutsche Biographie, Marstallplatz 8, D-8000 München 22, FRG.

George Ernst Stahl (1660–1734), was the founder of the phlogiston theory which was further developed by J. J. Becher and others. The theory stated that combustion of bodies was connected with invisible matter called phlogiston. this practically undetectable substance was thought to leave each material as it burned. Highly inflammable chemicals contained a lot of phlogistons, others less and oxides none at all. For this reason, oxides rather than metals were thought to be elemental.

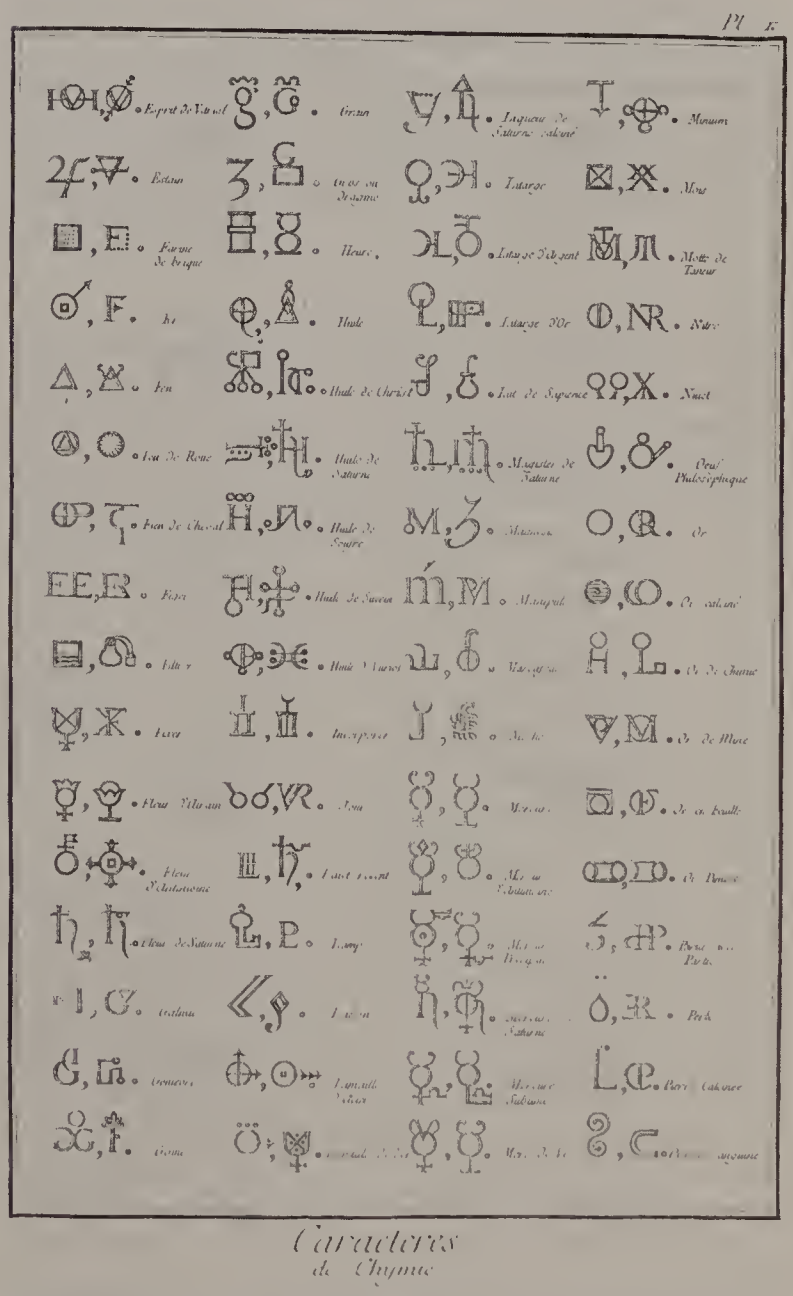
Torbern Bergmann (1735–84), professor of chemistry and pharmacy at Upsala (Sweden).

Antoine Laurent Lavoisier (1743–94) stands at the furnace in his laboratory, his noble dress protected by an apron. He is talking to the great French chemist Claude Louis Berthollet (1748–1822). Lavoisier was the first to explain the combustion process.

going on without the benefit of a universally recognized language based on an ordered system of thought. Indeed, for various reasons the exact opposite was aimed at: an arcane language which could be used to set down the secret knowledge of alchemy in such a way that it could be understood by only a few (and even, in quite a number of cases, by none).

It was not until the 18th century that serious attempts were made to set up a uniform system of nomenclature, initially for inorganic chemistry. Owing to the interdependence of language and theory mentioned above, this aim was beset by difficulties, as the language needed by the adherents of the phlogiston theory differed from that needed by the followers of Lavoisier[1].

At first, one could literally not be sure which substance was meant when a particular name was used. Most substances had several arbitrarily chosen names, and conversely a single name could describe different



Alchemical signs and their meaning shown on a beautiful copper plate from the year 1763. The signs are crytic codes and show only a metaphysical, metaphorical or even arbitrary relation to the substance they represent.

substances. There was thus a need to define names which were unique and substance-specific, but this called for a certain amount of knowledge about the internal structure of the compound to be named.

In his *Dictionaire de Chymie*, published in 1766, Pierre Joseph Macquer proposed that all salts of sulfuric acid should be called "vitriols". This gave rise to the basic idea of the binomial or two-part naming system which we use today[2].

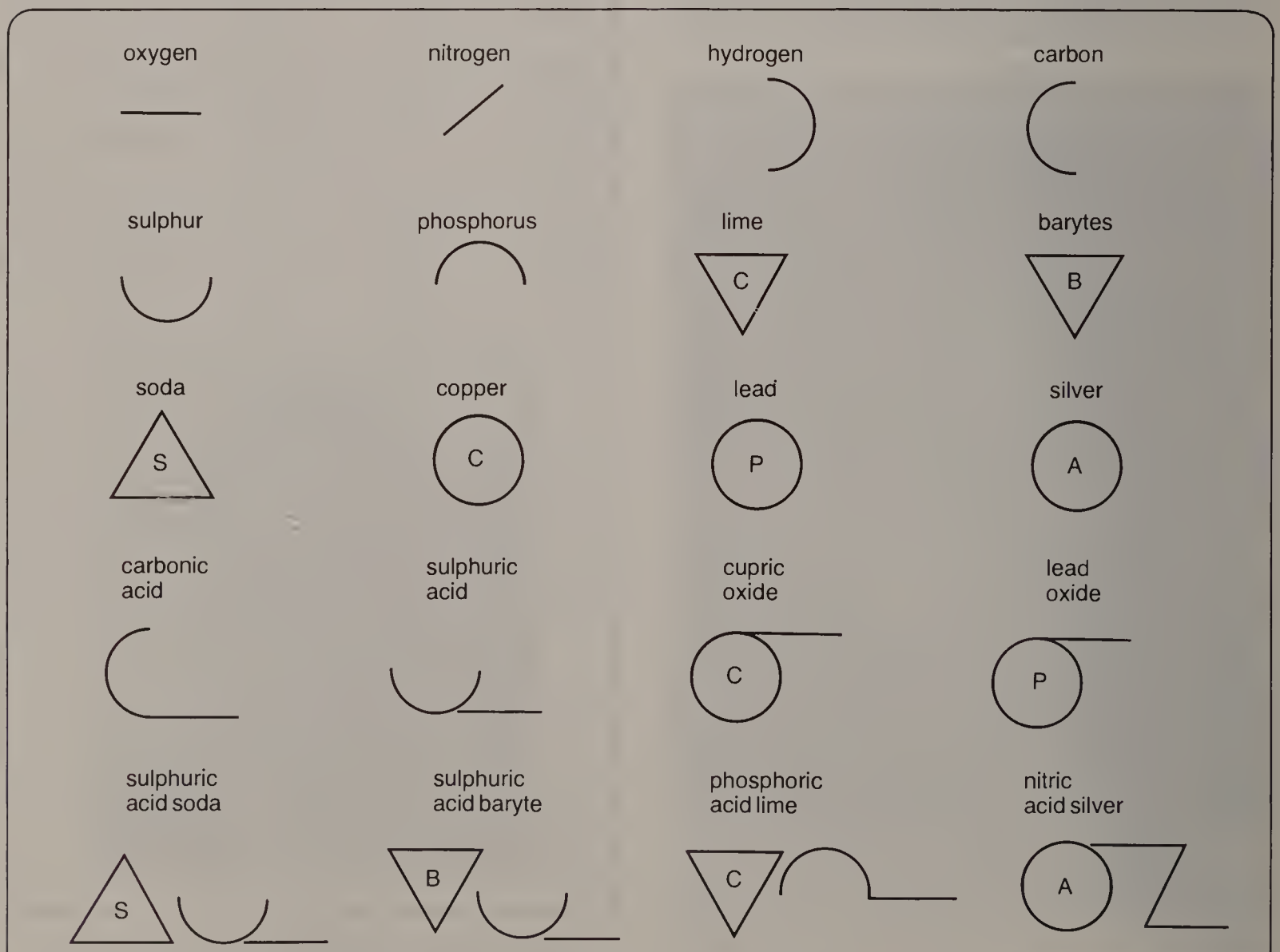
The next step forward was made by Torbern Bergmann, a Swede who had studied under Carl von Linnaeus before turning to chemistry. In 1773 Bergmann had coined the name *acidum aereum* for carbonic acid, and he called the salts of this acid *salia aerata*. He developed Macquer's ideas further, but had difficulty in naming slightly more complex substances such as double salts.

The first outline of a systematic chemical nomenclature was set out in 1782 by Guyton de Morveau. He divided compounds into acids, salts and bases, and constructed the name of a salt from that of the base and the adjective relating to the acid, for example, the copper salt of *acide vitriolique* was named *vitriol de cuivre*, and similarly one had, for example *nitre de mercure*.

At that time Morveau still held to the phlogiston theory (which also led him to introduce the term *phlogistique* to describe the simplest base), and consequently he was criticized by both the phlogiston school and its opponents. The former rejected his system because it contained too much that was new, while the latter did so because it was founded on an incorrect theory.

After Morveau's conversion to the Lavoisier camp, Lavoisier joined him in furthering his plan for a universal chemical language. The original concept was enlarged and it was made consistent with the oxygen theory. It now became possible to recognize the oxidation state of the base or of the acid moiety from the name of a compound.

In 1787 Lavoisier and Morveau, together with Berthollet and Fourcroy, published the new system of nomenclature: *Méthode de nomenclature chimique*. Predictably it met with a great deal of criticism, one of its most prominent opponents being Jean Claude de la Métherie. Nevertheless, the route which was indicated



The scheme of symbols shown above was suggested in 1787 by Pierre Auguste Adet and Jean Henri Hassenfratz. It was a further development of Bergmann's proposal in 1780 that related classes of substances should be represented by similar symbols. However, it suffered from the same inherent inadequacies and, like Bergmann's scheme, failed to gain acceptance.

in the "Méthode" turned out to be the only approach with potential. It enabled one to name a substance in a way which conveyed information about its composition, which was Lavoisier's main objective. In the years that followed, the system was gradually adopted in France and in other countries, and has continued to the present day.

The inorganic formula

The introduction of a standard method for naming inorganic substances was an important step in the progress of chemistry from a metaphysical to a rational science. Nevertheless, this achievement applied only to one part of the language of chemistry. How did things look with regard to the other part, the writing of chemical formulas? (Organic chemistry was still virtually non-existent in the late 18th century, and can be disregarded at this stage.)

In the pre-scientific era of chemistry, cryptic signs were used, which served more to conceal chemical information than to convey it. Etienne Francois Geoffrey, in his *Tables of Relationships* which were published in 1718 and were an important forerunner of the Periodic System, still used the symbols of alchemy mainly. Different symbols were used by the various authors, and to read the texts of that time called for considerable versatility (and still does today).

In 1780 Bergmann, whose name has already been mentioned, proposed that related classes of substances should be represented by similar symbols. The four elements (water, earth, fire and air) would be indicated by different triangles, the metals by a crown (any metal obtained by reductive smelting was described as a "regulus", that is, a minor king), alkalis and salts by a circle, and acids by a cross. By joining these basic symbols together in various combinations it was possible to construct patterns resembling formulas. This system only served as a starting point, and even its inventor did not always use it. Nevertheless, it qualifies as the first attempt at using combinations of symbols to convey information about the structure of a chemical compound.

John Dalton (1766–1844) who proposed the atomic theory of matter. The first and most important part of his *New system of chemical philosophy* was published in 1808. Later parts were printed in 1810 and 1827.

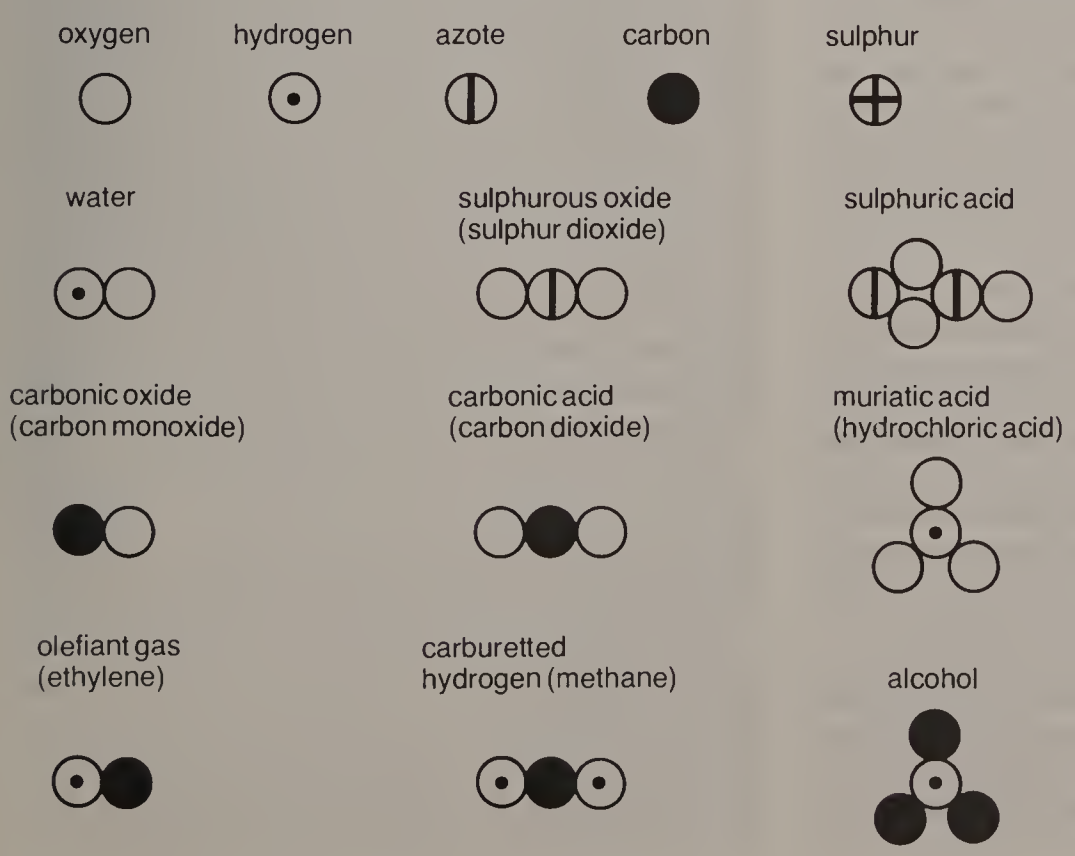


Figure. Examples of Dalton's atomic symbols.

The first proposal to be widely adopted as a way of writing chemical symbols came from John Dalton, the founder of the modern atomic theory. Dalton came to chemistry indirectly via meteorology, and he became engaged in a detailed study of various gases. Arising out of speculations about the origin of atmospheric pressure, he began in 1803 to develop the idea of mobile gas particles (atoms), and extended this model to solid and liquid substances.

The different sorts of atoms (elements) were represented by different types of circles. His symbols are partly reminiscent of those of the alchemists, but are of a quite different nature. Dalton deliberately chose a notation which was not based on initial letter abbreviations, since he wanted his formulas to not only indicate which types of atoms were present in a compound, but also to contain information about their supposed spatial arrangement. Consequently the symbol for carbon was used not only to indicate the presence of carbon, but also to represent a carbon atom (see Figure). The formula for carbon dioxide thus implied that one carbon atom was attached to two oxygen atoms. Dalton therefore belongs to the tradition of Hassenfratz and Adet, but at the same time can also justifiably be regarded as the first proponent of a theory of chemical structure.

The considerations which had guided Dalton in devising his atomic symbols caused Berzelius, on the other hand, to dismiss them. Berzelius, the creator of the modern system of writing formulas, basically rejected the idea that a formula could, or should, include information about the spatial arrangement of the atoms in a compound. He regarded statements of this kind as pure speculation (with some justification).

Rather than include such statements in a formula, he preferred a system which expressed, in abbreviated form, the quantitative composition of a substance. He therefore introduced initial letter abbreviations for all the elements, derived from their Latin names (see Table 1); the quantitative composition was given by small superscript numbers following the atomic symbols (see Table 2). (The convention now generally used was introduced in 1834 by Liebig.) Berzelius limited the information given in his formulas to that which could be proved experimentally, that is, by analysis.

There is some irony in the fact that Dalton's line of thought was rejected by Berzelius, since in 1830 Berzelius coined the term "isomerism", thus defining a condition which could not be accurately represented in his formula system. That Berzelius himself was not entirely consistent in following the rule of limiting the information given to that which could be experimentally proved is evident from the fact that he always used the "dual" notation for the formulas of salts, of the form $MO^a + YO^b$ (M = metal, Y = non-metal).

The Berzelius formula system eventually gained universal acceptance. The reasons for this lie firstly in the greater convenience of his symbols from a typographical standpoint, but certainly also in the fact that the possibilities inherent in Dalton's system were considerably ahead of their time.

Jöns Jacob Berzelius (1779–1848) was of enormous influence on the development of structural chemistry and perhaps the most well respected chemist of the early 19th century.

Table 1. Letter abbreviations devised by Berzelius.

O	oxygen
H	hydrogen
N	nitrogen
S	sulphur
P	phosphorus
Cl	chlorine
Br	bromine
J	iodine
F	fluorine
C	carbon
B	boron
Si	silicon
Se	selenium
Te	tellurium
As	arsenic
Cr	chromium
V	vanadium
Mo	molybdenum
W	wolfram
Sb	antimony
Ta	tantalum
Ti	titanium
Os	osmium
Au	gold
Ir	iridium
R	rhodium

Table 2. Berzelius and his contempories did not distinguish between atomic and molecular weights. In his famous *Lärbok i Kemien* (Teaching book of chemistry), translated by Friedrick Wöhler, Berzelius included extensive tables listing the "atomic weights of inorganic bodies", examples of which are shown in this table. Listed are the Latin names (*nomina*) of various salts of acetic acid together with their formulas written in the typical "Berzelius point notation". Points stand for oxygen; crossed letters for the suffix 2 (e.g. ~~N~~ = N_2); Ā for acetate. The right-hand column gives the molecular weights (*pondera atomica*) of the components based on O = 100.

nomina	*formulae*	*pondera atomica*
Aluminicus	$\ddot{\dot{A}}l\bar{A}^3$	2571.90
Ammonicus	$\dot{N}\dot{H}^4\bar{A}$	970.14
Argenticus	$\dot{A}g\bar{A}$	2094.80
Bartyicus cum aqua	$\dot{B}a\bar{A} + \dot{H}$	1712.55
Bismuthicus	$\dot{B}i\bar{A}$	1630.11
Cericus	$\ddot{\dot{C}}e\bar{A}^3$	3378.96
Cupricus	$\dot{C}uA$	1138.88
tri Cupricus cum aqua	$2\dot{C}u^3\bar{A} + 3\dot{H}$	4597.99
Ferricus	$\ddot{\dot{F}}e\bar{A}^3$	2907.97
Glucinicus	$\ddot{\dot{G}}\bar{A}^3$	2892.09
Hydrargyricus	$Hg\bar{A}$	2009.01

The rise of organic chemistry

For inorganic chemistry there had developed by 1830 a nomenclature and formula convention which was self-consistent and accepted by the overwhelming majority of scientists, and which essentially satisfied the requirements for a chemical language as set out at the beginning of this article. Nevertheless, one should not overlook the fact that the underlying theory had by no means fully developed yet, as there were still widely diverging ideas regarding the definitions of atoms and molecules, and even widespread doubts about the existence of chemically indivisible units of matter[3]. The use of the notion of atoms as a heuristic model was not disputed, however, nor was the practical usefulness of nomenclature and the method of writing formulas.

However, the advancing knowledge of ever more novel substances in the early part of the last century sometimes produced irritating results. Numerous substances made up of carbon and hydrogen were discovered, and many which in addition contained oxygen, sulfur, nitrogen or phosphorus. These compounds could not be simply fitted into the established scheme of acids, bases and salts, a difficulty which presented many leading chemists of the time with problems which one can scarcely conceive of today.

What was at stake was nothing less than the unity of chemistry as a science. In order to maintain this unity, one needed to be able to classify every compound which came from the living or "organic" world, or was related to it, in a single theoretical model which must also be valid for mineral substances, and could not be simply disregarded for these. This was no easy task, and it eventually led to the convening of the first ever international meeting of chemists, at the historic congress in Karlsruhe in 1860. Several important stages of the long route leading thereto will now be outlined briefly[4].

"What was at stake was nothing less than the unity of chemistry as a science".

At the beginning of the 19th century only a small group of substances belonging to modern organic chemistry was known, namely alcohol (ethanol), vinegar (dilute acetic acid) and ether (diethyl ether), all of which had long been familiar[5]. There were few definite ideas concerning their constitution, and the names had arisen in an arbitrary way. During the 19th century this list was extended by the addition of further newly prepared compounds, and these were named according to where they occurred in nature, for example, "ants' acid" (formic acid), "milk acid" (lactic acid), "lemon acid" (citric acid), "clover acid" (oxalic acid).

The publication by Guyton and Lavoisier, which had laid the foundations of inorganic nomenclature, contained an appendix which proposed a systematic means of differentiating between the various compounds known at that time as "ethers". These early attempts at developing a nomenclature failed to develop beyond isolated ideas, since organic chemistry was not yet clearly recognized as a distinct science.

During the early decades of the last century, the need for a system of classification became increasingly urgent owing to the rapidly growing number of known carbon derivatives. In 1835 J. B. Dumas and E. M. Péligot showed that "wood spirit" (methanol) resembled alcohol in many respects, and that these, together with a number of other compounds, could be assembled into a series of substances with similar chemical properties and continuously changing physical properties. It became apparent that series of this kind could also be compiled for other groups of substances such as the chlorohydrocarbons

In 1843 C. Gerhardt coined the term "homologous series". This scheme of classification not only introduced a structuring of organic compounds from a chemical standpoint, but also enabled one to predict the existence of members of a series which had not yet been isolated, together with approximate values for

Justus von Liebig (1803–78) professor of chemistry in Giessen and (since 1852) in Munich, was the most famous German chemist of the 19th century. He introduced the teaching of chemistry through practical training courses and established agricultural chemistry. Moreover, he was editor of *Annalen der Chemie* (Annals of Chemistry), the leading German journal of the time.

their physical properties. A further classification in organic chemistry, also still used today, was proposed by William Prout in 1827 — the distinction between fats, carbohydrates and proteins. To these early systematizations, based on empirical grounds, can also be added the introduction of the alkaloids group of substances, arising from the discovery of morphine by Sertürner in 1817.

Some further classification models resulted from theoretical considerations. The possibility that the chemistry of the ever-growing number of carbon-containing compounds might be subject to laws other than those applying to "mineral chemistry" seemed very disturbing, and there was therefore a search for theoretical models which would preserve the essential unity of chemistry.

It was for this reason that the discovery of the benzoyl group "benzoyl radical" by Liebig and Wöhler in 1832 was regarded as an important breakthrough, as it was thought that this could provide the key to a theory uniting the two parts of chemistry. In modern terms these "radicals" were molecular fragments which remained unchanged in a variety of substitution reactions. The "radical theory" regarded these as the analogues of the inorganic elements. "In mineral chemistry the radicals are simple; in organic chemistry they consist of combinations; that is the only difference" concluded Liebig and Dumas in their "Report on the present state of organic chemistry", published in 1837[6].

Berzelius especially welcomed the radical theory, as it appeared to support the "dualistic" concept which he had put forward, whereby organic compounds, like inorganic compounds, were held to consist of an electropositive and an electronegative component. Liebig and Dumas also believed that it would now be possible to develop a binomial nomenclature for organic compounds, analogous to that for inorganic compounds, thus restoring the unity of chemistry.

During the 1830s the radical theory became widely accepted, only to be then replaced by the "types theory" of Laurent and Dumas. Already in 1828 Gay-Lussac had said that it should be possible to replace a hydrogen atom by a chlorine atom, and he thus recognized the principle of substitution reactions, even though at first there was no experimental evidence.

Friedrich Wöhler (1800–82) was professor of chemistry in Göttingen and a close friend of Liebig. Wöhler is famous today mainly for his synthesis of urea in 1828, which, however, was by no means Wöhler's sole or most significant contribution to organic chemistry.

In 1839 Dumas discovered trichloroacetic acid, which, according to the dualistic theory of Berzelius, ought not to have existed since an electropositive element (H) had been replaced by an electronegative one (Cl). The types theory took this discovery into account by modifying the radical concept and assuming that only the carbon skeleton remained unaltered, carrying ligands which could undergo substitution. However, this took away the elemental character of the radicals, and cast renewed doubts on the unity of inorganic and organic chemistry.

Bitter controversy

The types theory was a subject of bitter controversy, with Berzelius leading its opponents; unfortunately there were also differences between Dumas and Laurent, who disagreed over the question of priority.

The 1850s saw the formulation of the "new types theory", arising from A. W. Hofmann's research on amines; its full development was due to C. Gerhardt, and especially to A. Williamson in his *Papers on Etherification* (1850–55)[7]. The theory was based on the idea that all organic compounds could be made up of a small number of basic inorganic structural units. According to this, alcohols and ethers belonged to the H_2O type, halogenated hydrocarbons to the HCl type, unsubstituted hydrocarbons to the H_2 type, and amines to the NH_3 type.

In this theory the types had even less of the character of organic elementary units, in the material sense, than did those of the older theory. They were simply structural analogies, no longer designed with the unity of the two areas of chemistry in mind, but instead aimed at establishing a rational scheme of classification for organic chemistry. The unification which had been sought, and which had been the main concern of the ageing Berzelius, was evidently receding even further into the distance. His passionate opposition to the Dumas–Laurent theory, and also, naturally, to the Gerhardt–Williamson theory, arose not so much from purely chemical considerations as from a philosophically based view of chemistry as a part of the broader order of the material world.

"The differences between the two branches of chemistry were even further emphasized by the development of appropriate formulas".

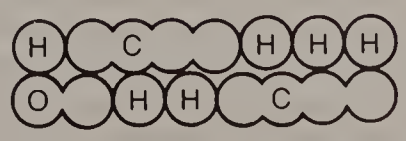
The differences between the two branches of chemistry were even further emphasized by the development of appropriate formulas. Although the chemical symbols introduced by Berzelius for the elements proved to be again suitable here, they were used in a different way. Fundamental difficulties arose due to the uncertainties regarding atomic weights.

Sausage formulas

Friedrich August Kekulé von Stradonitz (1829–96), professor of chemistry at Ghent and in Bonn, was responsible for initiating the Karlsruhe Congress. He is renowned for his benzene structure.

Besides the very modern looking notations proposed by Couper and Meyer, August Kekulé wrote formulas in which atoms were represented as rows of adjacent circles. In these "sausage formulas" an oxygen atom consisted of two circles and a carbon atom of four. Hydrogen was represented by a single circle. Bonds were represented by the touching of the circles.

In this notation, ethanol had the following structural formula[9]:



These formulas served to represent not the geometrical structures but the valencies — which at that time were called basicities or atomicities. The same applied to the other systems mentioned — despite their similarity to modern structural formulas.

Modern formulas did not finally arrive until van't Hoff and LeBel introduced the tetrahedron model in 1874.

Even when a reliable elemental analysis was to hand — already a difficult and time-consuming undertaking before the introduction of Liebig's five-flask apparatus — large differences arose according to whether the formulas were calculated using the values 6 or 12 for the atomic weight of carbon, and 8 or 16 for that of oxygen. This uncertainty alone resulted in there being four different empirical formulas for each compound. Moreover, while neither a universally agreed definition of molecular weight, nor the concept of valency, yet existed, it was impossible in principle to agree on whether the formula for benzene should be C_2H, CH, C_6H_6 or some other combination; provided that the alternative formula yielded a C/H ratio in agreement with that found experimentally, the choice of a particular formula was merely a question of personal taste.

In 1833 Berzelius invented the concepts of the "rational" and "empirical" formulas. The latter was meant to express only the proportions of the elements present, reduced to the smallest common denominator, while the former would give information about the internal arrangement of atoms or groups of atoms[8]. Berzelius was well aware of the problems associated with writing down such rational formulas, and he regarded them as a way of expressing theoretical ideas rather than a statement of factual knowledge.

Gerhardt saw a formula as little more than a means of expressing a statement about a reaction. For him the number of formulas which could be used for a compound depended on the number of reactions in which it took part. With this view, the rigid connection between theory, formulas and nomenclature was abandoned, and arbitrariness was elevated to the status of a principle. Further difficulties were encountered in the form of different types of isomerism and the occurrence of oligomers, which were not yet understood.

Up to this point chemists had talked only of empirical formulas. It was widely believed that one could not determine the geometrical structures of molecules, and there were also doubts as to whether these structures remained constant for a given compound or were continually changing, perhaps as an oscillatory process. (This statement also applies to the rational formulas mentioned above, which can be regarded as analogous to the formulas of salts in inorganic chemistry.)

A notation resembling structural formulas first appeared in connection with attempts to represent forces acting between the atoms of a molecule (A. S. Couper, 1858). The idea of a molecular structure was introduced by Butlerow in 1861, and in 1864 Lothar Meyer used formulas which already closely resembled those of today; in 1868 Wichelhaus coined the term "valency".

The Karlsruhe Congress

During the 1850s there were thus a number of different views on how organic compounds should be classified and named, and there was no clear agreement regarding the function, meaning and notation convention of formulas. This situation was evidence of extreme uncertainty concerning the theoretical foundations of organic chemistry; there were serious doubts as to whether it was basically of a similar nature to inorganic chemistry — Dumas even questioned whether atomic weights with fixed values should be used in organic chemistry. Even the very existence of atoms was questioned (yet again). For example, Liebig observed that it might be more useful to work again exclusively with equivalent weights instead of atomic weights.

It was widely felt that this situation was unsatisfactory, and there was a search for ways of arriving at a basic foundation of agreement. The exchange of results and ideas had hitherto occurred through personal contacts and letters between individual scientists, and through publications. Chemical societies and associations were still in their infancy (the Chemical Society of Great Britain was founded in 1841, the Société Chimique de Paris in 1857, the Deutsche Chemische Gesellschaft in 1867, and the American Chemical Society in 1876).

The question was how best to achieve the desired unification. In 1851 Charles Daubeny expressed the view that a generally agreed basis of language and theory could only be established by a prominent scientific figure, through the medium of his influence on students. However, this route turned out to be impracticable. Instead the decisive push came in 1860 from Auguste Kekulé, who was then 31 years old. He convinced his friend Karl Weltzien of the need for a great meeting of all the leading chemists of Europe. According to a letter which Kekulé wrote to Weltzien in March 1860, this conference would bring about an agreement as to which of the various theories showed most promise of success, and would in addition arrive at a standardization of nomenclature and the writing of formulas.

In collaboration with Adolphe Wurtz a circular was drafted inviting scientists to the conference convened in Karlsruhe for 3–5 September 1860. It included the following outline of objectives[10]. "To define important chemical ideas, such as those expressed by the words 'atom', 'molecule', 'equivalent', 'atomicity' and 'basicity'. To examine the question of equivalent weights and chemical formulas. To establish a uniform notation and nomenclature."

The appeal was answered by about 140 chemists from nearly every country of Europe. The congress was envisaged as a forum at which different points of view could be explained in discussions and papers, and hopefully an agreement would be reached on generally accepted views.

So as not to antagonize anyone, the organizers of the meeting avoided any statements or actions which might have been interpreted as favouring particular points of view. For this reason it was also considered undesirable to have a firm agenda fixed in advance. The topics to be discussed were to be decided by a committee elected at the start. As the meeting proceeded, this committee co-opted more colleagues,

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New names & addresses
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IUPAC Nomenclature Guides

Quantities, Units and Symbols in Physical Chemistry (*The Green Book*)
Edited by i. Mills, T. Cvitaš, K. Homann, Nicola Kallay and K. Kuchitsu, it is published by Blackwell Scientific Publications, 1988. 144 pp., illustrated. ISBN 0-632-01773-2. Price, cloth: GBP 20.95/USD 35.75 (GBP 15.75/USD 27.00).

The first edition of the *Manual of Symbols and Terminology for Physicochemical quantities and Units*, of which this the direct successor, was prepared for publication on behalf of the Physical Chemistry Division of IUPAC in 1969. This book had as its objective, the clarity and precision, and wider agreement in the use of symbols, by chemists in different countries, among physicists, chemists and engineers, and by editors of scientific journals. The second and third editions of the "*Green Book*" were revisions to take account of various developments in the *Système International d'Unités* (SI), and other developments in nomenclature. This present volume is a substantially revised and extended version of the earlier editions, with a slightly simplified title. These extensions include some of the material previously published in appendices, all the newer resolutions and recommendations on units by the Conférence Générale des Poids et Mesures (CGPN), and the recommendations of the International Union of Pure and Applied Physics (IUPAP) of 1978 and the International Organization for Standardization. The table of physical quantities has been extended to include defining equations and SI units for each quantity and the style has been changed from being a book of rules towards being a manual of advice and assistance for the day-to-day use of practising scientists.

Abbreviated List of Quantities, Units and Symbols in Physical Chemistry
by K. H. Homann, 1987. 4 pp., laminated card. Available in packs of 10 or 50. 10 pack, ISBN 0-632-01774-0. 50 pack, ISBN 0-632-01775-9. Price 10 pack, GBP 17.25/USD 22.15 (GBP 12.90/USD 16.60). 50 pack, GBP 77.60/USD 114.30 (GBP 58.20/USD 85.70).

Based on the more comprehensive IUPAC document, *Quantities, Units and Symbols in Physical Chemistry*, this laminated list is intended as a ready reference to the symbols most frequently used by authors, teachers and students in chemistry and related disciplines. It is an invaluable information source on the internationally recommended symbols for the most important physical quantities and units used by chemists and includes such subjects as: base SI units and physical quantities, SI prefixes, SI derived units with special names and symbols, recommended symbols for commonly used physical quantitites, units outside the SI and values of some fundamental constants.

Nomenclature of Organic Chemistry — (*The Blue Book*)
Edited by J. Rigaudy and S. P. Klesney, it is published by Pergamon Press, 1979. 580 pp. ISBN 0-08-022369-9, hardcover. Price USD 52.00.
This edition of the organic chemists "bible" contains comprehensive and detailed recommendations of the IUPAC Commission on Nomenclature of Organic Chemistry. "*The Blue Book*" is an essential reference work in the organic chemist's personal library. Institutional library's will find it indispensable as well.

Nomenclature of Inorganic Chemistry — (*The Red Book*)
Edited by G. J. Leigh, it is published by Blackwell Scientific Publications, 1989. Third edition, approx 300 pp., 286 illustrations. Cloth: GBP 39.50. Paper GBP 15.50. ISBN Cloth: 0-632-02319-8. ISBN Paper 0-632-02494-1.

Chemical nomenclature has attracted attention since the beginning of chemistry, because the need to exchange knowledge was recognized from the early days. The Greeks, for example, gave names to ores and minerals and to the products extracted from them, such as metals and alloys; alchemists also felt it necessary to give names and symbols to their compounds. Later, Lavoisier's chemical treatise proposed a nomenclature for oxoacids. The need to exchange information and therefore propose nomenclature has persisted and the responsibility for providing nomenclature to the chemical community has been assigned to IUPAC, whose *Rules for Inorganic Nomenclature* have been published and revised in 1958 and 1970.

Since then many new compounds have appeared, particularly with regard to coordination chemistry and boron chemistry, which were difficult to name from the 1970 Rules. Consequently, the IUPAC Commission of Nomenclature on Inorganic Chemistry decided to thoroughly revise the latest edition of the "Red Book". Because many of the new fields of chemistry are very highly specialized and need complex types of name, the revised edition will appear in two parts. Part 1 will be mainly concerned with general inorganic chemistry; Part 2 with more specialized areas such as strand inorganic polymers and polyoxoanions.

This new edition represents Part 1; in it can be found rules to name compounds ranging from the simplest molecules to oxoacids and their derivatives, coordination compounds, and simple boron compounds.

Compendium of Analytical Nomenclature: Definitive Rules 1987 (*The Orange Book*)
by H. Freiser and G. H. Nancollas, it is published by Blackwell Scientific Publications, 1987. Second edition, 288 pp., 16 illustrations. ISBN 0-632-01907-7, Price GBP 36.80/USD 47.50 (GBP 27.60/USD 36.00).

This authoritative compendium will be invaluable to all who need to use the officially recommended analytical nomenclature adopted by IUPAC. Prior to 1977, these recommendations were only available in the individual reports as they appeared, from time to time, in the IUPAC journal *Pure and Applied Chemistry*. This present work is a revision and extension of the first edition of the compendium published in 1978, and includes the additional nomenclature reports which have been finalized and/or updated by IUPAC since 1977.

Compendium of Chemical Terminology: IUPAC Recommendations (*The Gold Book*)
Compiled by (the late) V. Gold, K. L. Loening, A. D. McNaught and Pamil Sehmi, it is published by Blackwell Scientific Publications, 1987. 464 pp., illustrated. Cloth ISBN 0-632-01765-1. Paper ISBN 0-632-01767-8. Cloth GBP 51.75/USD 80.00. Paper GBP 33.90/USD 57.50. (Cloth GBP 38.80/USD 60.00) (Paper GBP 25.40/USD 43.10).

The compendium is an alphabetical listing of terms used in chemistry, with the definitions recommended by various IUPAC commissions dealing with nomenclature and terminology. Terms from physical, inorganic, organic macromolecular, and analytical chemistry published up to the end of 1985 are included. The book differs from other chemical dictionaries in that the definitions are truly authoritative, being recommendations agreed by committees of experts after consultation with the chemical community; it is intended to be ongoing as some important areas of chemistry have not yet been the subject of IUPAC recommendations and thus is the first step towards a comprehensive and authoritative chemical dictionary.

Cont'd from p. 224.

and by the end of the conference it included nearly half the participants.

After three days the meeting dispersed without a decisive outcome. Considered at its face value, the congress seemed to have been a failure. In fact, however, it was a very important event in the history of chemistry. There are two main reasons for this discrepancy between the immediate impression and the actual effects.

The first of these is connected with Stanislao Cannizzaro, who at the end of the conference had a paper, published by him two years previously, but up to then scarcely noticed, distributed to the participants. Lothar Meyer describes the effect which this "sunto" had on him as follows[11]: "I ... was amazed at the clarity which the pamphlet brought to the most important controversial points. It was as though scales had fallen from my eyes, the doubts vanished, and a feeling of the most serene conviction took their place".

It was much the same with many other readers of the article. The paper did not contain results from new experiments and ideas. Instead it was a lucid explanation and summary of the facts so far known relating to Avogadro's Hypothesis. I think that the effect which the paper produced can be explained not so much in terms of its content as by the timing of its distribution, coming at the end of the congress.

The intense discussions, and the personal gathering of such a large internationally constituted group, induced a state of mind which allowed recognition of an underlying structure, providing an interpretation of the many bewildering experimental observations. Without being fully aware of it, the scientific "republic" had discovered a new form of communication, a form which — as befits a republic — was based not on the authority of the few but on the consensus of the many. This is the second reason for the great importance of the Karlsruhe Congress.

"Without being fully aware of it, the scientific 'republic' had discovered a new form of communication, a form which — as befits a republic — was based not on the authority of the few but on the consensus of the many."

Although it was important for the development of theoretical chemistry, the 1860 congress provided no new approaches to the unification of nomenclature. In 1879 the Chemical Society laid down rules to be followed by those who published work in its journal. It was well recognized, however, that such rules were not a substitute for an international agreement.

Definite steps were taken in this direction in 1889, at an international conference in Paris under the auspices of the world exhibition held there. A panel of experts consisting of 25 members from 14 countries was set up. Each member was to draw up detailed proposals, and these were then examined by a standing committee of seven in Paris (chaired by Charles Friedel). From the individual memoranda the committee prepared a document which was to serve as the basis for discussion at a further large conference. Comparing this procedure with that adopted in 1860, one clearly sees the rapid progress made in developing efficient patterns of communication, although this had only now become possible against the background of agreement being reached on fundamental theoretical questions.

The planned conference on nomenclature took place at Easter 1892 in Geneva; the "Geneva nomenclature" adopted at that meeting was introduced into the third edition of Beilsteins *Handbuch der Chemie*, and although greatly extended and partly modified it remains in use today.

Agreed atomic weights

Despite some organizational shortcomings, the principle of setting up agreed language rules by means of congresses and commissions had proved valuable. This route was also followed with regard to the question of reaching agreement on atomic weights. As has already been indicated, scarcely any uniformity in this matter had been achieved by the middle of the century.

In 1869, the atomic theory had been given a sound framework by Meyer and Mendeléev, and could thenceforth be regarded as firmly established, but the question of a reference basis still remained to be settled. For the heavier elements there were in fact appreciable discrepancies according to whether one used H = 1 or O = 16 as the reference basis. (At that time the C = 12 standard had not yet entered the discussion.)

The initiative towards resolving this problem belonged to the German Chemical Society. In December 1897 the Society had set up a commission consisting of H. Landolt, W. Ostwald and K. Seubert, to produce a list of the "current most probable values" for atomic weights of common elements based on the reference value O = 16. After a year's work the commission presented its report, but emphasized that it would be "highly desirable" to reach an international agreement on the subject.

The society's governing board also took this view, and on 30th March, 1899 Landolt, Ostwald and Seubert therefore invited "the chemical societies and similar institutions of all countries" to form an international commission on atomic weights[12]. The response was very positive, and within six months the commission was formed; 58 scientists from 11 countries (including Japan) made up the committee.

The participants were required to set down their views on the questions of whether atomic weights should in future be calculated by taking O = 16 as the

standard, the degree of precision with which the values should be given, and whether it would be useful in future to have a standing commission for the continual revision of atomic weights. The replies received were published. A large majority were in favour of O = 16. It was also generally agreed that a small standing committee should be set up. These results had been achieved after only half a year's work. As the questions had been posed clearly and unambiguously, there was no need to call a conference along the lines of those in 1860 and 1892. The "International Atomic Weights" were quickly adopted, thus completing the setting up of a definite framework for the language of chemistry.

In 1911, at the instigation of Albin Haller and Ostwald, the "Association Internationale", a confederation of the chemical societies of Germany, France and Great Britain, was set up. Here again questions of nomenclature and the unification of formula conventions were in the foreground of activities. The association's third conference held in Brussels in 1913, known as the "Solvay Congress", became a part of chemical history.

During the second half of the 19th century a process began which led to an extension of the methods of scientific communication beyond those which had been common up to then, with far-reaching consequences. Helped by international gatherings and expert committees, the language of chemistry was moulded, unified and made ever more precise. Now, as in the past, progress in science depends on the achievements of individuals and of well-integrated groups. However, the conditions which make successful research possible were only attained through widespread communication and the resulting agreements reached on a basis of international cooperation.

The congresses of Karlsruhe, Geneva and Brussels were milestones on this path, leading eventually to the setting up of IUPAC[13].

Notes and references

1. For further details see: H. Kopp, *Geschichte der Chemie* (4 vols), Braunschweig 1843–47; for this topic, Vol. 2, pp. 413–426. M. P. Crosland, *Historical studies in the language of chemistry*, London, Melbourne, Toronto 1962, pp. 133–227.
2. There were forerunners such as O. Croll and C. Neumann, but although they used two-part names this was not combined with the idea of a uniform nomenclature.
3. C. Priesner, *Zur Entwicklung der Atom- und Molekülde finition in der Chemie im 19. Jh.*, In: Ch. Schönbeck (Ed.), *Atomvorstellungen im 19. Jh.*, Paderborn, Munich, Vienna, Zürich 1982, pp. 7–34.
4. Details can be found in the older books, e.g. H. Kopp, *Die Entwicklung der Chemie in der neueren Zeit*, Munich 1873, pp. 707–840, and a more modern account in Crosland, pp. 285–354. See also the monograph by C. Graebe, *Geschichte der organischen Chemie, Bd. 1*, Berlin 1920; reprinted Berlin, Heidelberg, New York 1969.
5. The view, still often held today, that Valerius Cordus was the first to give an exact recipe for the synthesis of ether, was disproved as long ago as 1928 by E. Darmstaedter. See E. Darmstaedter, *Zur Geschichte des Äthers, Journal für praktische Chemie* **120**, 1928, pp. 74–88.
6. J. B. Dumas and J. Liebig, *Sur l'etat actuel de la chimie organique*, Comptes Rendus 5, 1837, pp. 567–72.
7. C. Priesner, *Spiritus Aethereus — Formation of Ether and Theories on Etherification from Valerius Cordus to Alexander Williamson*, Ambix 33, 1986, pp. 130–152.
8. A. Kekulé in 1861 gave no less than 19 different "rational formulas" for acetic acid, and added that he could not guarantee that the list was complete; A. Kekulé, *Lehrbuch der organischen Chemie*, 4 Vols, Erlangen 1861–87. On this point see Vol. 1, pp. 58. Kekulé also gives an informative review of the various theories of organic chemistry.
9. A Kekulé, *Lehrbuch der organischen Chemie, Bd. 1*, pp. 164, footnote.
10. Cited in Crosland, pp. 344.
11. The original title of the "sunto" was: *Sunto di un corso di filosofia chimica*, first published in *Nuovo Cimento* **7**, 1858, pp. 321–326. A German translation was published by L. Meyer in the series *Ostwalds Klassiker der Naturwissenschaften, Bd. 30*, 1891. The passage quoted is on page 59 of Meyer's comments on Cannizzaro's paper.
12. The text of the letter, the list of members of the Commission, and the texts of the individual statements are printed in: *Berichte der deutschen chemischen Gesellschaft* **33**, 1900, pp. 1847–1883. Regarding the work of the Commission, see also: *ibid.* **31**, 1898, pp. 2761–2769; **37**, 1904, pp. 7–10; **38**, 1905, pp. 7–23.
13. R. Morf, *IUPAC — Ein geschichtlicher Uberblick*, Chemiker-Zeitung, 85, 1961, pp. 639–643.

Acknowledgement

Photographs courtesy of Deutsches Museum Munich.

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these are published in *CI* as recent reports.

If you would like to comment on the provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the IUPAC Secretariat. The most up-to-date list of national/regional centres appeared in *CI*, Vol. 11, No. 2, p. 67, 1989.

Selection of terms, symbols and units related to microbial processes

The List of the Selected Terms, Symbols and Units related to Microbial Processes differs from the one recommended earlier (*PAC*, Vol. 54, No. 9, pp. 1742–1749, 1982) by some clarifications and additions. These are due to the developed knowledge and, correspondingly, new quantities formulated which describe particular characteristics of growth and product formation, specifically, integral energy characteristics.

Substantial differences between the present list and its predecessor arise from a need to bring the nomenclature and symbols relating to microbial growth into maximal accordance with the newly established recommendations contained in *Quantities, Units and Symbols in Physical Chemistry* (prepared for publication by Ian Mills, Tomislav Cvitaš, Klaus Homann, Nikola Kallay, and Kozo Kuchitsu; published on behalf of IUPAC by Blackwell Scientific Publications, Oxford, 1988).

Ambiguity of a term leads to misinterpretation — it can complicate mutual understanding between scientists. Therefore, in describing particular terms, both existing and new, short explanations are given when deemed necessary in the text itself and footnotes.

The material is not only a list of rules but a manual of assistance for day-to-day use by practising scientists and engineers as well.

Comments on the document should be sent by 30th June, 1990 to: V. K. Eroshin, Institute of Biochemistry and Physiology of Microorganisms, Academy of Sciences of USSR, SU-142292 Pushchino-na-Oka, Moscow Region, USSR.

Publications

New *Solubility Data Series* pricing policy

As a result of the new contract between IUPAC and Pergamon Press for publication of the *Solubility data series*, substantial savings over the published price of USD 85.00 per volume are available to IUPAC members, affiliates and other individuals. The new special prices are:

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Microcomputers in tertiary chemical education

The December 1988 issue of *International Newsletter on Chemical Education* (No. 30) is devoted entirely to microcomputers in tertiary chemical education. The articles in this issue describe just a few of the current applications of microcomputers around the world, in countries as diverse as Argentina, Brazil, China, India, Kenya, UK, USA and USSR.

The articles included are: A library of physical chemistry software (P. B. Ayscough, UK); Microprocessor training using low-cost 8085 equipment (P. K. Ghosh, India); Teaching chemical kinetics assisted by a computer (V. Gianna, Argentina); Computers are here to stay (J. W. Moore and E. A. Moore, USA); Teaching chemistry with dBASE II (Qian Pu, People's Republic of China); Computer application in the process of teaching chemistry (E. M. Sokolovskaya and V. V.

Sorokin, USSR); Drawing molecular structures with the microcomputer (E. L. Teixeira and H. H. R. Schor, Brazil); and Student microcomputer projects for teaching university chemistry in Kenya (A. R. Tindimubona, Kenya).

Modified polymers

The IUPAC-sponsored 7th Bratislava Conference on Modified Polymers was held from 5–8th July, 1988 in Bratislava, Czechoslovakia. The conference dealt with recent advances in the preparation and properties of modified polyolefins.

The following topics were discussed:

- Chemical modification of polyolefins (that is, grafting on to polyolefin chains, functional groups, cross linking).
- Regulation of supermolecular structure and its influence on the properties of polyolefins.
- Additives to polyolefins (prodegradants, flame retardants, stabilizers, antistatics, antioxidants, fillers).
- Polyolefin based blends and composites.

About 130 participants from 16 countries contributed to the scientific programme, which consisted of 10 main lectures, 10 invited contributed lectures, 28 short lectures and 83 posters. The full texts of the main lectures and invited contributed lectures appeared in Volume 28 of *Makromol. Chem. Macromol. Symp.* (1989).

Polymer ageing

Five of the Prague Meetings on Macromolecules have been devoted to degradation and stabilization problems. There have been four microsymposia: Mechanisms of inhibition processes in polymers (1972); Degradation and stabilization of polyolefins (1975); Mechanisms of degradation and stabilization of hydrocarbon polymers (1979); and Processing and long-term stabilities of hydrocarbon polymers (1983).

The 5th meeting was the IUPAC-sponsored 11th Discussion Conference on Macromolecules: Chemical and Physical Phenomena in Ageing of Polymers, held in Prague, Czechoslovakia, 11–14 July, 1988. The nine main lectures presented at this conference together with 12 posters were published in Volume 27 of *Makromol. Chem. Macromol. Symp.* (1989).

New clinical chemistry journal

In July 1989 the International Federation of Clinical Chemistry (IFCC) started publication of its own journal — *The Journal of the International Federation of Clinical Chemistry*. The journal will be published six times per year.

The new journal replaces *IFCC News*, although much of the content of the former newsletter will be included in the new journal — which is to be distributed at no charge to members of IFCC member societies.

Unlike most journals in this field, the new journal will focus more on the day-to-day problems of the clinical laboratory than on original research. Initially, at least, most of the articles will be invited from experts in various areas of the steadily expanding field of clinical chemistry.

The contributions will include review articles concerned with the frontiers of clinical chemistry, together with articles related to all aspects of laboratory organization and management. Since chemists in many parts of the world are responsible for tests that are often performed in the hematology, microbiology or immunology laboratories in other countries, the new journal will address all branches of laboratory medicine.

Don't blame IUPAC

Did you hear loud background noise when you telephoned the IUPAC Secretariat recently? No, the International Union of Radio Science was NOT jamming IUPAC's telephones. Could you not get through at all? No, the Secretariat staff were not deliberately leaving the telephones off the hook.

Perhaps, when you visited us, you thought a bomb had dropped on Bank Court Chambers. And then when you eventually found the offices (it took some time because there was no lighting) the Secretariat staff could not even provide you with a glass of water after your travels. Did you conclude that the nuclear winter had prematurely descended on Cowley?

An exaggeration perhaps, but yes there have been many times over recent months when the IUPAC Secretariat has been without electricity, water and/or telephones. The scenes of devastation that have met the recent visitor to the Secretariat are not the result of an earthquake. Cowley Centre is being reconstructed so that all of us here will have a better environment. Yippee. Meanwhile "Work in Progress (Bryant Construction)" with all its concomitant noise of banging drilling, sawing and power generating, is hardly conducive to "Work in Progress (IUPAC Secretariate)".

Biennial Report of the Treasurer

Prof. Anders Björkman

The Biennial Report of the Treasurer for 1987/1988 was presented to Council at the 35th IUPAC General Assembly held in Lund, Sweden, August 1989.

Introduction

In my previous report (for 1985/1986: see pp. 236–239 of the November 1987 issue of *CI*) I dealt with new endeavours to revise the financial conduct of IUPAC affairs. These ideas and plans will partly be reiterated below, but in different contexts.

Unfortunately, a growing load of various responsibilities has inhibited my efforts to finalize the improvements of IUPAC financial working conditions. Yet, I find it vital to present here an overview of IUPAC financial matters as of today. To limit the report, some traditional items are omitted.

The IUPAC Treasurer, Prof. Anders Björkman.

Financial status

As usual, we may first take a look at the last accounting biennium, resulting in *excesses* of income over expenditure (USD):

Accounts		Budget
1987	163 635	42 500 (as of 87.02.17)
1988	32 676	33 640 (as of 87.08.28)

It is senseless to add these figures together, because they originate from different budgeting biennia. Moreover, the 1987 figure is from the third updated version, while the 1988 figure is from the budget, approved by Council.

The 1987 "improvement" of around USD 120 000 (as compared to the budget figure given) is explained by some gains, mainly:

- more complete payments of outstanding national subscriptions (USD 22 000)
- an increase (USD 64 000) in interest and dividends earned
- lower expenditures for IUPAC bodies and the general assembly (USD 76 000) counteracted by increased office expenses (partly a result of the GBP/USD exchange rate variation).

The remarkable accordance between the excess figures for 1988 could indicate a better command of the course of events, but this is not entirely true. The income from assets and publications became considerably higher than indicated by the budget figures, while office expenses grew at a similar rate. The budget for 1989 predicts an excess of expenditure over income of USD 86 000. Therefore, if the 1988 accordance of the budget/accounts is repeated in 1989, the biennium will result in a deficit as budgeted.

In the 1985/1986 report, it was illustrated that the USD currency level may obscure the financial outcome, by giving key figures in both USD and JPY. This comparison is repeated for 1987 and 1988 (the 1988 figures being normalized by setting 1987 figures to 100):

	JPY/USD	Total assets		Income from assets		Operating expenses	
	(ICSU)	USD	JPY	USD	JPY	USD	JPY
1987	135	100	100	100	100	100	100
1988	124	112	103	82	75	97	89

This time the difference between the changes, expressed in USD and JPY, is not dramatic. The income from assets is reduced considerably. A limitation of expenditure is also noted.

Budget preparation

A better understanding of IUPAC budgets can be gained by an analysis of some details. The items may be grouped under four classes (* indicates major items):

1. Budget figures, which are set and expected to hold, but not to be exceeded:
   * national subscriptions and related income
   * expenses of IUPAC bodies
   — contributions to symposia, etc.
   — representation to other organizations
2. Budget figures, which are estimated with some confidence and can be kept under control, provided the level of US-dollar exchange rates remains fairly stable:
   * office expenses
   * affiliate membership scheme
   — provision for handbook
   — ICSU (income/expenditure normally balance)
   — bad debts
3. Estimates, not truly controlled:
   * income from assets (interest, dividends)
   * transfer from publications subaccount
4. Educated guess:
   General assembly.

Major items only will need any comments.

The normally largest item, the general assembly, will be examined first. Minimized costs for travel and subsistence are the general principle. Yet, the choice of venue is made from national invitations, which places a limit on the possible savings, even though a considerable part of the costs are met by the host country. For the budget, one can only predict a figure, which appears to be realistic on the high side. If it would turn out to be an underestimate, the claims may have to be reduced somewhat. Conversely (and preferably), as the total costs stay below the budget figure, this excess is not to be used for other purposes. We thus accept an element of risk for this item, and a gain/deficit will, at the end of the biennium, influence the level of assets. The Treasurer is more involved in the conduct of this item than previously.

Another major item is the expenses of *IUPAC bodies*. The present budget procedure, starting a good half year before the general assembly, is handled by the Treasurer, who receives budget requests from the chairmen of standing committees and division/section presidents.

Since 1986 we operate with current *A-programmes* (medium or long-range) and priority *B-programmes* (urgent because of their importance, mainly for divisions). The allocations to A and B differ in that the latter obtains earmarked money, which may suffice better and is given more flexibility in use, for example, with regard to statutory restrictions to titular members. Since the profiles of the divisions differ, the requests for, and use of, A and B money exhibit notable variations. The matter needs further clarification due to its great importance for the allocations.

The Treasurer presents the requests from chairmen/presidents to the other officers of the union, who make a *preallocation*, which is updated before the final budget proposal is presented to the Bureau and Council for approval. Before the start of the new budget biennium, a final allocation is made by the Treasurer, in conjunction with the other officers.

The *Affiliate Membership Scheme* is linked to the IUPAC magazine (*CI*) and constitutes the main part of the information obligations. The aim of AMS is to be financially self-supporting, but it does obtain some support from the IUPAC budget.

The considerable *income* from *assets* and from *publications* can only be estimated. During recent years the investments (bonds and shares) have been given much attention, which has raised the income. The contractual strategy chosen for publications has acted in the same direction. These financial improvements, however, have the character of windfalls. National subscriptions remain the primary source of income.

Remaining input information on budget items, for example, office expenses, is provided by the Secretariat.

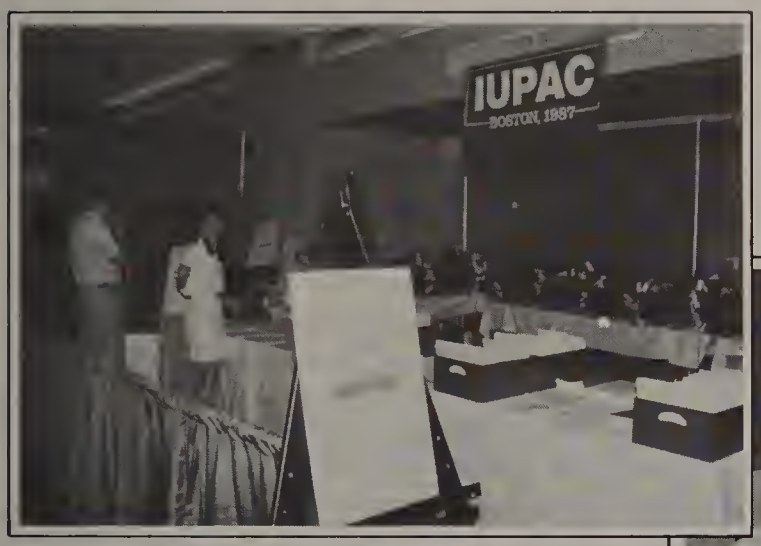
The impact of *general financial prospects* and the state of assets is discussed in the Finance Committee (making the forecast on income from assets). A policy on the maintenance of assets was presented in my previous report, and will not be resumed here.

The key consideration in the entire budget work is the level of income from *national subscriptions*. The IUPAC activities are the determining factor. In principle, this level may move up or down, but with the prevailing growth of chemistry around the world, a lowering of the level is unlikely to occur. The matter is considered by the officers (when the preallocations are made to IUPAC bodies), and the agreed proposal is expressed as the total figure entered for IUPAC bodies in the tentative budget, presented by the Treasurer to the Executive Committee on the same occasion.

Preparation of the budget, based on plausible requests from IUPAC bodies, implies a forward planning and a command of the budget work through better insight. It yields a fair and rational use of the resources. Financial management is not a goal in itself: the aim is to maximize the results of scientific activities.

After the budget has been approved by Council, the total figure for the national subscription income is fixed in US-dollars. The apportionment of this income amongst the member countries is done according to the Leuven/Lyon/Lyngby subscription scheme, based on established figures for national chemical turnover from earlier years. These published figures may change somewhat from the time of budget approval, to the time for sending out the invoices, but a possible major change in the currency exchange rates of the US-dollar constitutes a larger uncertainty. This can be a serious problem to the member countries, and it might be overcome by fixing the national subscriptions as the figure in national currency at the US-dollar exchange rates, which apply on the day of the budget approval in Council. It implies that the true subscription income can be higher or lower than budgeted. However, the deviations may balance out over the years, and in the

The 34th IUPAC General Assembly was held in Boston, USA in 1987. Even though a considerable part of costs are met by the host country, the general assembly is normally the largest item on the budget.



end the income needed from subscriptions is determined by the IUPAC activities as allocated by the officers and approved by Council.

For many years the Finance Committee has updated budgets. The mere modification of figures never became truly informative nor used for any purpose. Thus the 1987 budget, as approved by Council in 1985, predicted an excess of expenditure over income (a deficit) of USD 41 500. Early in 1986 this figure had been reduced to USD 14 500 and early in 1987 it had changed into an excess of income over expenditures of USD 42 500. In the final accounts the figure had risen to USD 163 600! I believe that it is better to devote our efforts to the new primary budget proposal and in the management of resources.

Accounting in Oxford

The way that the IUPAC accounts are handled in our Zürich bank has not allowed any information on the balance of a year until the statements of accounts are issued in January of the following year. As outlined above, the largest cost items have been under close surveillance, which is why expenditures could hardly get out of control. Yet, the unavailability of financial summaries during the year has been felt increasingly to be unsatisfactory. For one thing, it is difficult to consider changed or supplementary allocations, when the overall financial situation is not clear in more detail during the year.

This predicament will be overcome by moving, hopefully early during 1990, the accounting from our bank to the Oxford Secretariat where the main part of the account material is generated anyway. Our bank will still receive income and make payments (except the routine payments at the Oxford Secretariat), and the accounts as well as the audit will be issued formally in Zürich. Since the assets and "Treasurer's Office" remain at the bank, the legal domicile will stay in the Canton of Zürich, and IUPAC can retain its tax free status there.

This transfer of accounts is expected to be carried out fairly easily and with only a marginal investment. The wide scope is to have management accounting with immediate access to any set of figures, to serve not only the Treasurer and Secretariat, but all IUPAC persons in leading positions. The matter has been discussed with some experts, but a decision on any larger investment is not yet taken. In this field it is not possible to make a long-range decision. The vital problem is to identify a reasonable level of investment for a medium-range computer plan.

Handling expenditures

However well the budget procedure and the allocations are carried out, it remains to implement the results through various procedures, dominated by claim forms. The number of IUPAC bodies is large and the bodies conduct activities differently, which is why

the task is complex. The information on the governing decisions and on the practice is spread over many documents, and oral testimony has been the customary thing. A set of guidelines has never been produced. After extended analysis of the entire matter and widespread enquiries within IUPAC, I shall attempt to organize the material in a useful order and to issue such guidelines.

Restructuring

A major restructuring of IUPAC may have financial implications but, as the matter stands today, no more can be said. One may hope that the improved accounting, when established at the Secretariat, will facilitate the required changes.

As reported by the Chairman of the Finance Committee, Dr H. F. Wilson, this body has suggested a considerable alteration of its structure to become a smaller group of proficient people. I support the proposal, provided that the new body will comprise both financial expertize and a profound knowledge about IUPAC activities and functioning. A new role for the committee would be to assist the Treasurer in his responsibility to exert "internal audit".

Acknowledgements

The oppressing tasks of the Treasurer can only be achieved by substantial support from a number of people. In the first place I wish to commend our Secretariat. The Finance Committee has been a forum for stimulating counsel. I would also like to state my recognition of several useful contacts with devoted people within IUPAC. Inasmuch as the burden seems to grow, it is a pleasure to express my appreciation of the support and personal stimulus I have enjoyed, and I would welcome comments and criticism, induced by this report.

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IUPAC Accounts for 1988

The audited IUPAC accounts for 1988 are preceded by the auditors' report and an introduction by IUPAC Treasurer Prof. Anders Björkman.

Introduction

A thorough analysis of each year's accounts is made by the Secretariat and Treasurer for two reasons: as a control and as part of the financial planning. Most details, hidden behind the figures, are not of common interest. This introduction will only present some major guiding comments.

The biannual budget for 1988/89 was prepared up to and approved by the Council meeting in Boston 1987. This was the first time that a new budget procedure was applied for divisions and standing committees. It was found that the requests from IUPAC bodies could be met to a high degree, without raising national subscriptions. With the favourable state of the assets, the officers also decided to use a small amount of money outside the budget for high-priority purposes. The new procedure means, for the first time, that the money approved was adapted to activities planned before the budget was approved by the Council.

The money for IUPAC bodies (except for the general assembly) is assigned to, but not used in, the first year of a budget biennium. A provision (of the order of 40% of the total money) is made for use in the second year (1989). If the bodies perform as expected, nearly all the budgeted money will be spent by the time of the general assembly. Since even good planning may not be precise, it is allowed for a body to exceed the allocated money by 5%.

Some variance occurs with the payments of national subscriptions. The invoices to national adhering organizations (NAOs) total precisely the budgeted figures, while the actual payments may be made in a following year the assets are in a good state, some spread of payments will only have a marginal effect. Yet, it is with some regret I note, that outstanding subscriptions income rose in 1988 with around USD 40 000 above the "low mark" in 1987. This is mainly due to a single (rare) late payment.

Romania failed to pay subscriptions in 1986 and 1987 and has thereby left the Union. The missing income will be written off against bad debts. The introduction of the Leuven/Lyngby/Lyon subscription scheme will soon be finalized by payments or by writing off some outstanding subscriptions. Hereafter, only late payments will remain subject to the statutes. The provision made for bad debts is adequate to take care of the subscription losses indicated above.

As predicted (see letter to NAOs published on page 44 of the March 1988 issue of *CI*) the income from assets has decreased (around USD 30 000). Conversely, the income transfer from the publications sub-account did increase almost USD 40 000 compared to budget.

The "General Purposes Account" of the 1988 budget included a provision (transfer) of USD 28 100 to the affiliate membership scheme (AMS) budget. Of this provision only USD 5000 for developing countries appears as expenditure in the 1988 accounts, while USD 8794 of the 1987 provision to AMS in the balance sheet (USD 13 349) has been used for affiliate activities. The increase of costs for *CI* in 1988 will be paid only in 1989.

A comparative analysis between the 1988 budget and accounts is also presented in the biennial report of the Treasurer for 1987/88 (see previous item).

Anders Björkman
Treasurer

Auditors' Report

As auditors of the International Union of Pure and Applied Chemistry we have examined the accounts for the year ended 31st December, 1988 in accordance with the provisions of Swiss law. Our examination included a review of the accounting records at the Union's Secretariat in Oxford.

We have come to the conclusion that:

- the balance sheet and statement of income and expenses are in agreement with the books,
- the books of account have been properly kept,
- the financial position and the result of operations are presented in accordance with the principles of evaluation prescribed by Swiss law and the requirements of the statutes.

As a result of our examination we recommend that the accounts submitted to you be approved.

Neutra Treuhand AG

Balance Sheet as at 31st December 1988 (expressed in USD)

Assets		
Cash in Banks		
US Dollars	42 517.22	
Sterling	5 032.00	
Swiss Francs	145.00	
German Marks	4 733.00	
Money Market Investments	538 714.00	
Cash in East European Banks[a]	4 452.50	595 593.72
Marketable Securities at Cost		1 775 941.98
Accounts Receivable[b]		10 136.79
Sundry Debtor		49 225.00
Subscriptions, etc. Outstanding[c]		
National Organizations	101 250.00	
Observer Countries Service Charges	175.00	
Company Assoc. Service Charges	350.00	101 775.00
		2 532 672.49

Liabilities		
Capital Account		2 117 727.40
Accounts Payable[d]		12 502.02
Paulo Franzosini Fund		5 659.20
Provisions		
Committed Expenditure	168 000.00	
Bad Debts	71 493.50	
CHEMRAWN Rolling Fund[e]	20 231.26	
Neutra Examination	8 000.00	
Affiliate Activities[f]	4 555.55	
Solubility Data Series	1 820.83	
Publication Activities	3 805.00	
Seminars, IVPs[g]	107.00	
History of IUPAC[h]	20 000.00	
IUPAC Handbook 1987–9[i]	15 000.00	
R. Soc. Contribution to Dev. Country Activ.	7 692.50	320 795.64
Excess of Income over Expenditure	32 675.91	
Deprec./Profit on Sold Securities and Swap	43 312.32	75 988.23
		2 532 672.49

Notes for 1988 Balance Sheet

(a) *Cash in East European Banks*

Bulgaria	262.50
Czechoslovakia	4 090.00
Hungary	100.00
USSR	0.00
	4 452.50

See Affiliate Membership Scheme Income and Expenditure Statement.

(b) *Accounts Receivable*

Swiss Computation Tax	7.00
List Zurich	10 129.79
	10 136.79

(c) *Subscriptions, etc. Outstanding*

National Organizations (1985)		
Belgium	8 500.00	
Poland	7 700.00	16 200.00
National Organizations (1986)		
Romania		8 600.00
National Organizations (1987)		
Romania		8 600.00
National Organizations (1988)		
Argentina	4 800.00	
Austria	800.00	
Belgium	10 150.00	
Cuba	700.00	
Egypt	2 800.00	
Iraq	2 600.00	
Ireland	3 000.00	
Japan	30 000.00	
Peru	700.00	
Portugal	700.00	
Romania	8 800.00	
Yugoslavia	2 800.00	67 850.00
Service Charges Company Associates (1986)		
Egypt		50.00
Service Charges Company Associates (1988)		
Canada	50.00	
Greece	25.00	
Italy	25.00	
UK	125.00	
USA	75.00	300.00
Service Charges Observer Countries (1987)		
Hong Kong		50.00
Service Charges Observer Countries (1988)		
Ethiopia	50.00	
Malawi	25.00	
Nigeria	50.00	125.00
		101 775.00

(d) *Accounts Payable*

List Zurich	3 647.02
List Oxford	1 556.00
Advance Payments 1989	7 299.00
	12 502.02

(e) See CHEMRAWN Income and Expenditure Statement.

(f) See Affiliate Membership Scheme Income and Expenditure Statement.

(g) IUPAC Visiting Professorships.

(h) Subsidy towards publications: completion of manuscript delayed.

(i) To be paid in 1989.

Statement of General Income and Expenditure for Year ended 31st December 1988 (expressed in USD)

Expenditure		
Office Expenses		
IUPAC Officers	4 480.89	
IUPAC Secretariat (non-publ.)	224 652.48	
Audit, Bank Fees, Other Charges	38 739.49	267 872.86
Expenses, IUPAC Bodies		
Administration Expenses	11 818.00	
Meetings:		
Other than Gen. Assembly	248 355.71	
General Assembly (1986)	11 175.00	271 348.71
Symposia, Seminars, IVPs		10 960.00
Bad Debts Write Off		920.00
Provisions Made		
Committed Expenditure[a]	168 000.00	
Bad Debts	15 000.00	
IUPAC Handbook 1987–89	15 000.00	
R. Soc. Contribution to Dev. Activities	7 692.50	205 692.50
Other Expenses		
ICSU Grant	8 000.00	
Contribution to ICSU	11 293.67	
Representatives Other Organizations	7 817.96	
Transfer for Affiliates in Dev. Countries	5 000.00	
Transfer to CHEMRAWN Subaccount	5 000.00	
Miscellaneous Expenses	827.00	37 938.63
Foreign Exchange Differences		5 381.15[b]
Excess of Income over Expenditure		32 675.91
		832 789.76

Income		
National Subscriptions		
Received	378 370.38[c]	
Outstanding	67 850.00	446 220.38
Company Associate Service Charges		
Received	6 350.00	
Outstanding	300.00	6 650.00
Observer Countries Service Charges		
Received	475.00	
Outstanding	125.00	600.00
Interest and Dividends Earned		175 484.68[d]
Subvention/Grants from ICSU		24 107.00
Transfer from Publication Subaccount		166 972.20
Withdrawals from Provisions		
Seminars, IVPs	3 460.00	
Bad Debts	920.00	4 380.00
Other Income		
R. Soc. Contribution to Dev. County Activities	7 692.50	7 692.50
Miscellaneous Income		683.00
		832 789.76

Notes for statement of General Income and Expenditure for the Year ended 31st December 1988

(a) Remaining funds for IUPAC bodies allocated for 1988–9.
(b) Because of currency fluctuations there is a loss (or gain) with GBP, CHF, and DEM relative to USD used for accounting.
(c) Includes return to Australia of USD 28 000.00 for overpayments during 1983–87.
(d) USD 172.30 interest on capital of Paulo Franzosini Fund already deducted and added to Fund.

Statement of Publication and Expenditure for Year ended 31st December 1988

Expenditure			Income		
IUPAC Secretariat (publ.)		127 736.00	*Publications*		
Sol. Data Ser.			Blackwell	266 721.96	
Expended	2 704.85		Pergamon	18 575.99	
Provision Made	1 820.83	4 525.68	Other Publishers	11 665.32	
Provision for Publication Activities		3 805.00	Secretariat	81.00	297 044.27
Miscellaneous Expenses		11 969.07	*Support of Publication Activities by Blackwell and Pergamon*		13 000.00
Transfer to General Income and Expenditure Account		166 972.20	*Sol. Data. Ser.*		
			Last Year's Provision	2 524.68	
			Income	1 000.00	3 524.68
			Miscellaneous Income		1 439.00
		315 007.95			315 007.95

Statement of CHEMRAWN Income and Expenditure for Year ended 31st December 1988 (expressed in USD)

Expenditure		Income	
Miscellaneous Expenses	4 434.30	*CHEMRAWN IV*	6 000.00
Transfer to CHEMRAWN Rolling Fund[a]	6 565.70	*Transfer from General Income and Expenditure Account*	5 000.00
	11 000.00		11 000.00

Note

(a) The USD 6565.70 increased the Fund from USD 13 755.56 to USD 20 321.26 (see Balance Sheet).

Statement of AMS Income and Expenditure for Year ended 31st December 1988 (expressed in USD)

Expenditure		Income	
Salaries	22 477.00	*Contributions*	
Share Secretariat Cost	8 958.00	In USD	63 202.31
Miscellaneous Expenses	15 111.00	In Foreign Exchange	3 900.00
Chemistry International and Leaflets	38 139.00	Royalties Blackwells	3 788.35
Transfer to 1989 Provision for Affiliate Activities	4 555.55	*Transfer from General Income and Expenditure Account*	5 000.00
		Transfer from 1987 Provision for Affiliate Activities	13 349.89
	89 240.55		89 240.55

Securities Account Statement as at 31st December 1988

			Approx. Price. %	Approx. Value USD	Book Value at Cost USD	Profit/Loss Since Purch. USD
(a) Bonds						
6.625% Eurofima 1985–14.2.92	JPY	5 000 000	101.00	40 083	28 661.00	+ 11 422.00
7.50% Deutschland 20.4.89	DEM	400 000	100.50	224 881	153 062.00	+ 71 819.00
5.75% Deutschland 186–20.6.96	DEM	200 000	95.65	107 014	108 473.00	− 1 459.00
6.0% Deutsche Bundepost 1987–1.7.97	DEM	100 000	96.15	53 786	55 063.00	− 1 277.00
3.5% Rhein. Westf. EW 1986–3.4.96	DEM	125 000	83.10	58 108	56 348.00	+ 1 760.00
6.75% Europ. Investm. Bank 22.8.97	DEM	70 000	102.75	40 235	30 937.00	+ 9 298.00
4.25% Hillsdown Holdings 27.12.02	GBP	50 000	92.50	82 959	85 038.00	− 2 079.00
7% B.P. 1985–14.3.92	JPY	5 000 000	104.00	41 273	29 468.00	+ 11 805.00
11.75% Nat. Westminster 1982–1.11.92	USD	100 000	105.00	105 000	99 230.17	+ 5 769.83
9.75% Marks and Spencer 15.3.93	GBP	50 000	96.625	86 659	87 919.00	− 1 260.00
6% UBS 1985–27.11.92	USD	150 000	89.25	133 875	134 352.11	− 477.11
7.75% IBM 30.3.91	USD	100 000	96.00	96 000	100 424.85	− 4 424.85
7% Schweden 1987–12.2.92	USD	125 000	92.50	115 625	119 524.43	− 3 899.43
4.625% Nagasakiya 1987–12.3.92	CHF	100 000	99.15	65 445	66 447.00	− 1 002.00
6.75% Dow Chemical 1985–24.10.95	DEM	100 000	104.75	58 597	44 372.00	+ 14 225.00
11.25% J.P. Morgan 1985–28.2.92	USD	100 000	101.75	101 750	99 165.70	+ 2 584.30
6.5% Philip Morris 1986–14.2.91	JPY	5 000 000	102.625	40 728	28 295.00	+ 12 433.00
11.375% Connecticut Savings 26.2.90	USD	60 000	102.00	61 200	60 560.17	+ 639.83
Sub-Total Bond				1 513 218	1 387 340.43	+125 877.57
(b) Shares						
Shs Fidelity Magellan Fund		8145.74	USD 48.32	393 602	388 601.55	+ 5 000.45
Total				1 906 820	1 775 941.98	+130 878.02

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in brackets.

1990

Natural products

4–9 February. 17th International Symposium on the Chemistry of Natural Products. New Delhi, India.
(Dr A. V. Rama Rao, Secretary, 17th IUPAC International Symposium on the Chemistry of Natural Products, Regional Research Laboratory, Hyderabad 500 007, India.)

Biological and environmental reference materials

5–8 February. 4th International Symposium on Biological and Environmental Reference Materials (BERM-4). Orlando, Florida, USA.
(Dr Wayne R. Wolf, Nutrient Composition Laboratory, Beltsville Human Nutrition Research Center, Agricultural Research Service, US Dept of Agriculture, Beltsville, MD 20705, USA.)

Porous solids

6–9 May. 2nd International Symposium on Characterization of Porous Solids (COPS-2). Alicante, Spain.
(Prof. F. Rodríguez-Reinoso, Dept. de Química, Facultad de Ciencias, Universidad de Alicante, Apartado 99, Alicante, Spain.)

Carotenoids

20–25 May. 9th International Symposium on Carotenoids. Kyoto, Japan.
(Prof. Masayoshi Ito, Kobe Women's College of Pharmacy, 4-19-1, Motoyamakita-Machi, Higashinada-Ku, Kobe 658, Japan.)

Polymer networks

20–25 May. 10th International Symposium on Polymer Networks. Jerusalem, Israel.
(Networks 90, Melia-Te'um, POB 8388, Jerusalem 91082, Israel.)

Catalysis

5–8 June. International Symposium on Unsteady State Processes in Catalysis (USPC). Novosibirsk, USSR.
(Prof. K. I. Zamaraev, Institute of Catalysis, 5 Prospekt Academica Lavryentyeva, SU-630090 Novosibirsk 90, USSR.)

Visas

It is a condition of sponsorship that organizers of meetings under the auspices of IUPAC, in considering the locations of such meetings, should take all possible steps to ensure the freedom of all *bona fide* chemists from throughout the world to attend irrespective of race, religion, or political philosophy.

IUPAC sponsorship implies that entry visas will be granted to all *bona fide* chemists provided application is made not less than three months in advance. If a visa is not granted one month before the meeting the IUPAC Secretariat should be notified without delay by the applicant.

Trace elements in health and disease

5–8 June. International Symposium on Trace Elements in Health and Disease. Helsinki, Finland.
(Trace Elements/NTES-COMTOX Meeting, Institute of Occupational Health, Office of Information and International Affairs, Ms Virpi Castrén, Topeliuksenkatu 41 a A, 00250 Helsinki, Finland.)

Ceramics

24–30 June. 7th World Ceramic Congress. Rimini, Italy.
(7th CIMTEC, — World Ceramics Congress, PO Box 174-48018 Faenza, Italy.)

Macromolecules

8–13 July. 33rd International Symposium on Macromolecules. Montreal, Canada.
(IUPAC MACRO 90 Secretariat, Dept of Chem. Engineering, McGill University, 3480 University Street, Montréal, Québec, Canada H3A 2A7.)

Mechanisms of polymer strength and toughness

16–19 July. 13th Discussion Conference on Macromolecules Mechanisms of Polymer Strength and Toughness. Prague, Czechoslovakia.
(13th Discussion Conference, PMM Secretariat, c/o Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, 16206 Prague, Czechoslovakia.)

Photochemistry

22–28 July. 13th IUPAC International Symposium on Photochemistry. Warwick, UK.

(Prof. F. D. Lewis, Dept of Chemistry, Northwestern University, 2145 Sheridan Road, Evanston, IL 60208, USA.)

Polymer analysis and characterization

23–25 July. 3rd International Symposium on Polymer Analysis and Characterization. Brno, Czechoslovakia.
(Dr Howard G. Barth, Du Pont Company, Experimental Station, Wilmington, Delaware 19898, USA.)

Organic synthesis

23–27 July. 8th International Conference on Organic Synthesis. Helsinki, Finland.
(Prof. T. A. Hase, c/o Travel Experts Limited, PO Box 22, SF-00101 Helsinki, Finland.)

Boron chemistry

30 July–3 August. 7th International Meeting on Boron Chemistry — IMEBORON VII. Torun, Poland.
(Prof. Marek Zaidlewicz, IMEBORON VII Secretary, Institute of Chemistry, Nicolaus Copernicus University, 7 Gegarin Street, 87-100 Torun, Poland.)

Solubility phenomena

1–3 August. 4th International Symposium on Solubility Phenomena. Troy, New York, USA.
(Prof. Sonja Krause, Dept of Chemistry, Rensselaer Polytechnic Institute, Troy, New York 12180, USA.)

Pesticide chemistry

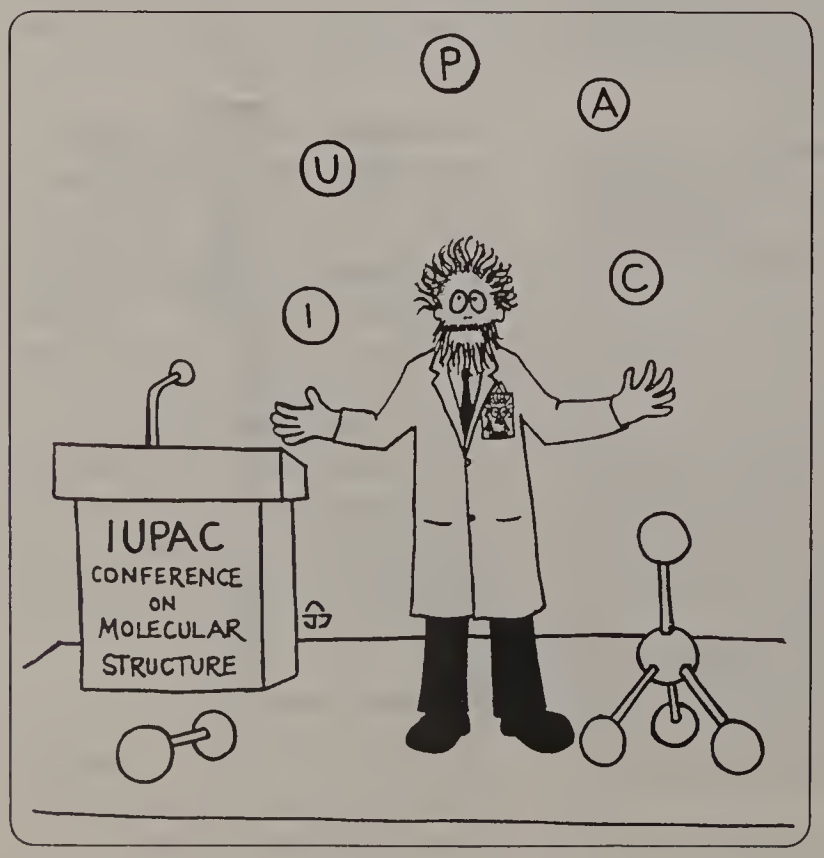
5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, Federal Republic of Germany.
(Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Solution Chemistry

6–10 August. 11th International Conference on Solution Chemistry. Ottawa, Canada.
(Prof. C. Detellier, Dept of Chemistry, University of Ottawa, Ottawa, Ontario K-N 9B4, Canada.)

Physical organic chemistry

6–10 August. 10th International Conference on Physical Organic Chemistry. Haifa, Israel.
(Prof. Yitzhak Apeloig, Dept of Chemistry, Technion-Israel Institute of Technology, Haifa, 32000, Israel.)



Raman spectroscopy

13–17 August. 12th International Conference on Raman Spectroscopy. Columbia, South Carolina, USA.
(Prof. J. R. Durig, Dept of Chemistry, University of South Carolina, Columbia, South Carolina 29208, USA.)

Coordination chemistry

13–18 August. 28th International Conference on Coordination Chemistry. Gera, GDR.
(Dr D. Walther, Sektion Chemie der Friedrich-Schiller-Universität, Steiger 3, Haus 111, Jena 6900, German Democratic Republic.)

Organometallic chemistry

19–24 August. 14th International Conference on Organometallic Chemistry. Detroit, Michigan, USA.
(Prof. John P. Oliver, Dept of Chemistry, Wayne State University, 554 Mackenzie Hall, Detroit, MI 48202, USA.)

Chemical thermodynamics

27–31 August. 11th IUPAC Conference on Chemical Thermodynamics. Como, Italy.
(11th IUPAC Conference on Chemical Thermodynamics, c/o Dip. to Chimica Fiscia Applicata, Politecnico di Milano, Via Golgi, 39, 20133 Milano MI, Italy.)

Polymerization reactions

9–13 September. International Symposium on Mechanisms and Kinetics of Polymerization Reactions: Their Use in Polymer Synthesis. Paris, France.
(Prof. E. Maréchal, Laboratoire de Synthése Macromoléculaire,

12 rue Cuvier, 75005 Paris, France.)

Safety in chemical production

10–13 September. 1st IUPAC Workshop on Safety in Chemical Production. Basel, Switzerland.
(This workshop is not open for general participation but restricted to a limited number of invited participants.)

Automation and new technology in the clinical laboratory

9–12 October. 4th International Congress on Automation and New Technology in the Clinical Laborary. Barcelona, Spain.
(Dr Roman Galimany, Secciódе Automatización, Servicio de Bioquímica, Residencia Sanitaria Germans Trias i Pujol, Carretera Canyet s/n. 08916 Barcelona, Spain.)

Speciality polymers

7–9 November. International Symposium on Speciality Polymers. Singapore.
(International Symposium on Speciality Polymers, c/o Dept of Chemistry, National University of Singapore, 10 Kent Ridge Crescent, Singapore 0511.)

1991

Polymer materials

10–15 February. Polymer 91: International Symposium on Polymer Materials: Preparation, Characterization and Properties. Melbourne, Australia.
(Polymer 91 Secretary, PO Box 224, Belmont, Victoria 3216, Australia.)

"Organic chemistry: technological perspectives"

15–19 April. 2nd International Symposium "Organic Chemistry: Technological Perspectives". Baden-Baden, Federal Republic of Germany.
(Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Spectroscopy

9–14 June. 17th Colloquium Spectroscopicum Internationale. Bergen, Norway.
(Prof. F. J. Langmyhr, Dept of Chemistry, University of Oslo, PO Box 1033, Blindern, 0315 Oslo 3, Norway.)

Organometallic chemistry

25–29 August. 6th International Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS). Utrecht, Netherland.
(Prof. G. van Koten, Laboratory of Organic Chemistry, Dept of Metal Mediated Synthesis, University of Utrecht, Padualaan 8, 3584 CH Utrecht, Netherland.)

Analytical sciences

25–31 August. International Congress on Analytical Sciences. Chiba, Japan.
(Prof. Eiji Niki, The Japan Society for Analytical Chemistry, 1-26-2-304 Nishigotanda, Shinagawa, Tokyo 141, Japan.)

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International Union of Pure and Applied Chemistry (IUPAC)

IUPAC

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 43 countries, each represented by a national organization, such as an academy of science or research council.

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